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A CLASS MODEL OF THE SPINAL CORD.

By Irving Hardesty.

(*From the Hearst Anatomical Laboratory of the University of California.*)

The value of allowing the student in anatomy to model various parts of the body has been thoroughly proven and in the more modern methods of teaching is a plan quite frequently employed. In the teaching of osteology modeling has been resorted to for some years in the Johns Hopkins University and in the University of Chicago, and during the past four years it has been especially successful in this laboratory.[1] In class work in other branches of anatomy it has also been found of great help. The reconstruction of arrangements which are of unusual interest or of those whose relations in the third dimension are difficult to acquire, has proven a very valuable means of instruction.[2] Modeling in class of various parts of the central nervous system by the use of potters' clay and differently colored floss has also been tried and strongly advocated.[3]

Modeling an organ or part of an organ not only fixedly directs the attention of the student upon its relative size and proportional dimensions, but, in actually constructing them himself, the more delicate inter-relations of the component parts and the finer details of contour are impressed upon him as in no other procedure. The only argument against the general application of the plan to all the parts of the body is the time it involves. Even those students who quickly develop considerable skill and rapidity in modeling and who possess a good sense of form would be unable to model anything like all of their dissections in the time usually alloted to the subject. The next best plan is to allow the modeling only of certain structures and arrangements whose mechanism and architecture are the more difficult to grasp. Even then the time will scarcely allow for each student of a class, or even each group of students working together, to model the same structures throughout the laboratory, for, since the regular dissection must precede, it means extra work for the student. In lieu of this, it should be found possible at least to have two or three students of a class spend a portion of their time in making a model of an important part, while the remainder of the class, keeping on with their regular dissection, watch the model grow from day to day. This they will do and with considerable interest, making intelligent comments and sug-

[1] Moody, R. O. Johns Hopkins Hospital Bulletin, Vol. XIV, March, 1903.
[2] Flint, J. M. Jour. Med. Research, Vol. VIII, Dec., 1902.
[3] Herring, A. P. Jour. Am. Med. Assoc., Vol. XLIII, Aug., 1904.

gestions and continually comparing the model with their own dissection, much to the profit of all.

In teaching microscopic anatomy with the usual and necessary sections on the slide, it is well known that one of the great difficulties lies in getting the student to realize third dimensions and to obtain an accurate mental picture of a structure in its entirety. In my experience in teaching this subject the modeling of a cell or group of cells, even off-hand, has often been of great aid in cases where the student has difficulty in obtaining morphology and relationships in perspective.

In teaching the microscopic anatomy of the central nervous system, I have tried to make it possible during the past years for some of the students of each year's class to make a model of the spinal cord showing the contour of the different levels comparatively, the position and changes in shape of the different columns of gray and white substance, and the origin, position, and functional direction of the principal axone pathways. The model has necessarily included one level of the inferior portion of the medulla oblongata, *i. e.*, a level through the decussation of the pyramids. The spinal cord has been taken because its structure is simpler than that of the encephalon and because in the order of study of the system it is taken up first. An idea of the structure of the spinal cord in perspective once obtained, the student looks upon the various preparations of the encephalon from a different and more comprehensive viewpoint and obtains a picture of its architecture with greater accuracy and considerably greater ease.

In these attempts at models of the spinal cord the procedure has been quite simple. The students undertaking it were supplied merely with the following: (1) an inch thick wooden board for a base; (2) pieces of stout wire to be inserted into the base for upright supports of the model; (3) a piece of small brass tubing (usually curtain rod) to represent the central canal; (4) thick cardboard upon which the various sections of the cord were outlined under similar magnification, then cut out, and the gray figure of each and the localities of the various fiber tracts colored in with crayons according to a definite color scheme; (5) some beads of suitable sizes and colors to represent the cell bodies of the different neurones; (6) balls of differently colored twine to string through the sections to represent the course of the fiber tracts, the colors corresponding to those of the color scheme on the cardboard; and (7) some wax and mucilage for holding the parts in place. One of the pieces of cardboard, usually that representing the cervical enlargement, was taken of sufficient size to include an outline of the dorsal and ventral roots with the spinal ganglion and the beginning nerve trunk with its dorsal division and rami communicantes schematically represented. Upon one side of all sections projections of the cardboard were left to suitably represent small proximal portions of the dorsal and ventral roots. Most of the beads representing the various nerve cells were more conveniently attached to their positions on the cardboard before arranging the latter in position. The beads were either stuck in position with wax or sewed onto the cardboard with fine thread. The twine representing their axones was attached to them later. Then the pieces of cardboard were punched in the localities of the different nerve pathways with holes just large enough to carry the twine and the central canal was punched out, and through the opening representing the canal the sections were strung on the brass tube and made fast at regular intervals along it. The whole was then attached to the stout wire upright supports inserted into the wooden base board and in this position the running in of the colored twine representing the fiber tracts was begun. The segment retaining the nerve roots and spinal ganglion required an extra support. This was attached to the ganglion so as to hold the roots curved caudad in their natural position. The twine representing ventral root axones was attached to the appropriate bead in the ventral horn and then stuck to the cardboard along its efferent course. The axones attached to spinal ganglion cells were stuck to the coardboard as naturally as possible in the more or less coiled condition close to the cell and the *T*- and *Y*-divisions were made by simply tying on another piece of twine to represent the bifurcation. Collateral branches were made in the same way. All end brushes or telodendria of both ascending and descending fibers of long or short course or of association and commissural axones were accomplished by simply tying a knot in the twine a short distance from the end and the end frayed into its component threads and these stuck about the beads representing the appropriate cell bodies. The cells of the nucleus fasciculi gracilis and nucleus fasciculi cuneati were represented by beads similar to those for spinal ganglion cells but colored differently, while the beads for the nucleus dorsalis (Clarke's column) and especially those for Golgi cells of Type II were of smaller size. No attempts were made to show differences in size of axones and only the general and more accepted and fundamental arrangements were undertaken. The finer detail and disputed relations would have made the model too complicated for practical use, the chief purpose of the model being for the student to get accurate foundation ideas upon which to build correctly and easily the additional ideas obtained in his reading.

Sections from six different levels were usually represented in the model, namely, from the conus medullaris, the third lumbar segment, the mid-thoracic region, the sixth cervical segment, the first cervical segment, and the decussation of the pyramids.

In my class in microscopic anatomy of the school year just passed, there fortunately developed a disposition to consider the making of a model of the spinal cord more seriously than in the procedure above described. One of its members, Mr. F. M. Allen, kindly gave considerable of his spare time to it, and the result is a model of more permanent construction and of more permanent value. The plan of its construction required considerable thought and may be of interest to those having to face similar problems.

A photograph of this model in partial profile is here given in Fig. 1. The different segments represented are indicated

in the lettering above each section. It is seen that there are eight different levels of the nerve axis involved instead of six as previously. A level through the beginning of the decussation of the lemnisci and the nuclei of the fasciculus gracilis and cuneatus is added in order to illustrate the central termination of the sensory neurones of the first order and the origin and beginning course of certain of the axones of the lemnisci or sensory neurones of the second order. The level is near the beginning of the decussation and therefore involves only the inferior tip of the nucleus of the twelfth nerve and of the inferior olivary nucleus and but a few of the fibræ arcuatæ externæ. Two levels of the thoracic region are represented instead of one, so that the contour of the thoracic decrease in diameter may be curved rather than angular and in order to obtain a greater extent of the nucleus dorsalis (Clarke's column) as well as to show structural variations found within this region.

The process of construction may be arranged in the following steps:

(1) Of the sections from the different regions used by the class, a set was chosen as perfect as possible as to preparation and normal appearances. Instead of using the dissecting microscope and millimeter ruler as used by the rest of the class for their laboratory drawings, each section of the set was enlarged to the same extent by means of the Edinger projection apparatus and both the periphery of the section, with its septa and ventral fissure, and the contour of the gray substance were carefully outlined on a sheet of smooth white paper and the paper labeled corresponding to the label of the slide. In the outline of the gray figure only the larger projections forming the reticular substance were undertaken, while the ingrowths of pia indicating the position of nerve fasciculi and the passage of root fibers were carefully reproduced.

(2) A mixture of 90 parts by weight of beeswax, 5 parts white rosin, and 1 part hard paraffin was used for the reconstructions, the rosin being added to increase the resistance of the wax to both handling and temperature. To make the plates this was melted and poured into shallow pans, and while melted each pan containing it was floated upon water. On the water the wax becomes level and cools with even thickness. In cooling it shrinks away from the sides of the pan and may be easily removed. The pan should be cold when the wax is put into it. A thin film of glycerine was sometimes used, but was not absolutely necessary.

(3) A sheet of the paper with the drawing of one of the sections upon it was then placed in position upon one of the plates and pressed down upon its smooth surface to insure against slipping and all the lines of the drawing carefully gone over with a hard pencil or smooth-pointed probe, thus transferring the drawing to the wax. Then for each section the paper was removed and the outline of the gray figure alone was transferred upon a second plate. Before cutting out the sections from the plates, the plates were placed in a thermostat raised to a temperature of about 45° C. for a few moments to soften. Then they were laid upon a smooth glass plate and cut out. In cutting, a very narrow instrument is necessary in order to follow the finer details of contour. An ordinary steel dissecting probe ground flat and to an edge on one side was found the best adapted to the purpose. When cut out the first plate consisted of the peripheral contour of the whole section of the cord with the gray figure, septa, etc., outlined upon it, while the second consisted of the gray figure cut out separately. The gray figure thus cut out was fitted over its identical outlines on the first plate with all its features superimposed and pressed down firmly. Pressure will cause the two to adhere firmly, but to insure permanency and to give a finished appearance to its contour, the edges of the gray figure were gone carefully around with a chisel heated sufficiently to melt the wax, thus smoothing the irregularities of cutting and cementing the two parts together more securely. Each section of the cord thus prepared was then compared in detail with the outlines of the original drawing and all irregularities and variations from the original contour were remedied by paring with a sharp, thin-bladed knife. Deficiencies in contour were easily remedied by fusing on bits of wax to complete them. The spinal ganglion (*G*, Fig. 1) with dorsal and ventral roots and beginning nerve trunk were schematically outlined upon and cut from a separate wax plate and were later fused to the section for which they were intended.

In climates subject to high temperatures in summer it would, perhaps, be advisable to use wood instead of wax for the sections. Either prepared basswood or the ordinary three-ply board used in furniture making would insure against warping and the outlines could be accurately followed with a scroll saw. Wood also would be less expensive. Wax was here used tentatively because of the ease with which the sections could be finished off and the ease with which the beads, etc., representing the various cells, could be attached. The beads had merely to be warmed, placed in position, and pressed slightly into the wax, where they stick. The wax also takes the paint, later applied, more accurately than wood.

(4) The choosing and placing in position of the representatives of the various types of nerve cells was next accomplished. While the cells can be quite readily put into the wax plates after they are arranged vertically in series, they can be more easily and uniformly arranged with the plates lying flat, face upward. Various sized beads were used to represent the cell bodies of all the types of neurones considered in the model except the large motor type of the ventral horn. In these alone an attempt was made to represent the external form of the type. The ventral horn cells were cast in Wood's metal. Two or three slightly varying models of cells were made in oil-softened modeling clay and molds made of them in plaster of Paris. Then from these molds a sufficient number of cells were made by first taking a piece of copper wire of the size used for axones in the rest of the model, placing it in the groove representing the axone in the mold with its end extended to the center of the mold, and then filling the mold with melted Wood's metal. The metal fuses upon the wire firmly, and upon cooling the cast may be removed by means

of it. These casts may be seen in position by examining Fig. 1 with a hand lens, and No. 7 in Fig. 2 is an illustration of one of them. The form of the spinal ganglion cell is closely approximated by the spherical beads. In lieu of a greater variety in the sizes of the beads, the same sized beads were used to represent the spinal ganglion cells of the Ranvier type, the cells of the nuclei of the fasciculus gracilis and fasciculus cuneatus and the recipient nucleus of the spinal tract of the trigeminus. Beads of smaller size were used for the nucleus dorsalis (Clarke's column), for the Dogiel spinal ganglion cell of Type II, and for the association and commissural neurones of longer course. A third and yet smaller size were used for the association and commissural neurones of short course, including Golgi cells of Type II, and for the portion of the nucleus olivaris inferior included in the model.

(5) The cells in position, the various sections were next painted according to a definitely prearranged color scheme. The back sides and edges of all the plates were painted black—the various structural details were contained on the cephalic or anterior surface of each section. The position, shape, and size of all the nerve fasciculi in their variations at the different levels were outlined with thin black lines which remained permanent, being used as limiting boundaries in the subsequent coloration of the parts. In outlining the fasciculi, Fig. 749 of Spalteholtz's *Atlas of Human Anatomy* was used largely as a basis upon which to build.

Several small holes were next drilled through each of the areas outlined for the fasciculi. These holes were of a size merely sufficient to carry the wire to be used in representing the fasciculi and attention was given to their uniform distribution in the areas of the different sections and to their increase or decrease in number at the different levels. Then the areas were painted their respective colors.

The color scheme employed throughout for the entire eight localities was as follows:

All cell-bodies were given a slightly different shade of the same color as that of the fasciculi with which they have to do.

Mass of gray figure of cord and gray masses of medulla.....grayish white.
General color of ascending cerebro-spinal fasciculi .....red.
General color of descending cerebro-spinal fasciculi .....blue.
General color of ascending cerebello-spinal fasciculi and bundles to brain stem at levels of cerebellum.....green.
General color of descending cerebello-spinal fasciculi and bundles from brain stem at levels of cerebellum..yellow.
General color of all fasciculi proprii....dark brown.

Colors in Detail:

Fasciculus gracilis (Goll's column).....vermilion.
Fasciculus cuneatus (Burdach's column) or middle root zone.....maroon.
Lissauer's or postero-lateral root zone..crimson.
Dorsal root and spinal ganglion (cervical region) .....dark crimson.
Comma shaped tract (Schultze's).....scarlet.
Fasciculus cerebro-spinalis anterior (direct pyramidal) .....deep blue.
Fasciculus cerebro-spinalis lateralis (crossed pyramidal) .....deep blue.
Ventral root fibers and cells giving origin to them .....light blue.
Fasciculus cerebello-spinalis (direct cerebellar tract) and cells of nucleus dorsalis (Clarke's column) .....green.
Fasciculus anterolateralis superficialis (Gowers') .....green dotted with yellow.
Fasciculus from nucleus vestibularis lateralis or Deiter's nucleus and from nucleus ruber (mixed lateral zone).yellow dotted with green.
Fasciculus sulco-marginalis .....yellow.
Fasciculus marginalis anterior .....yellow.
Helweg's fasciculus .....light brown.
Fasciculus proprius lateralis and ventralis .....dark brown.
Fasciculus proprius dorsalis (anterior root zone of posterior funiculus) and fasciculus septo-marginalis (oval bundle) .....dark brown.
Neurones of Golgi Type II.....blue black.
Tractus spinalis of the trigeminus.....chrome orange.
Lemniscus and arcuate fibers joining it.light maroon.
Arcuate fibers arising in olivary nucleus .....chrome green.
Afferent sympathetic axone to spinal ganglion .....red orange
Dogiel spinal ganglion neurone of Type II .....purple.

Commissural fibers were colored according to the neurone to which they belong, whether axones or collaterals of associational, commissural proper, pyramidal, or dorsal root neurones.

(6) A baseboard (*B*, Fig. 1) was chosen of sufficient width and length and with a thickness of two inches to insure plenty of stability. Three upright supports, *A*, 8 inches in length, were made of ½-inch steel rod, one end of each threaded into flange bases with 3 screw holes in each flange, and the other end fitted with set-screw eyes of a caliber sufficient to carry the brass tube (*cc*) which represents the central canal. These uprights were screwed upon the base-board as shown in the figure. To prepare the supports indicated by *S*. Fig. 1, the sections were first strung upon the brass tube by passing it through the central canal, bored out in each section to fit the tube. While stringing on the sections the tube was at the same time passed through the set-screw eyes of the supports, *A*. The sections were then arranged equidistant along the tube and, held ventral side down, measurements were carefully taken of the distance between the baseboard and the ventro-lateral edge of both sides of each section and the measurements recorded for the right and left sides of each. Then the sections were taken down till the supports could be prepared. For these, ⅛-inch steel rod was cut into lengths, each 1½ inches longer than the measured distance for which it was individually intended. All the lengths of rod being cut, holes one inch deep were bored into the baseboard at the required places of such a fit that the rods would have to be driven into them. Then a malleable copper washer of a width about equal to the thickness of the wax plates was fitted upon each of the rods ½ inch from the end and soldered firmly in place. One of these rods is shown in Fig. 2, No. 1. The rods were next driven into their respective holes in the baseboard, the upper end of each bearing the washer. Holes of the same size as those in the baseboard were bored ½ inch deep into the ventral edges of each section at the points where its

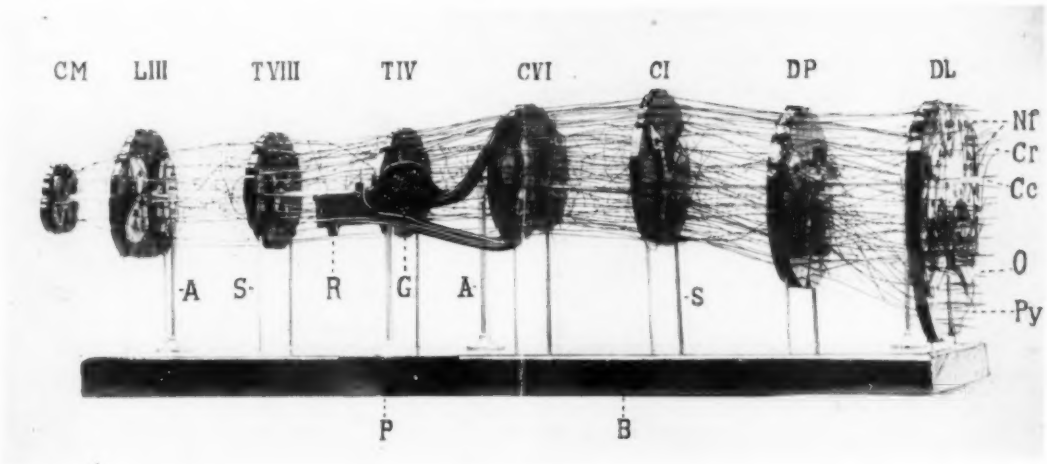

FIG. 1.

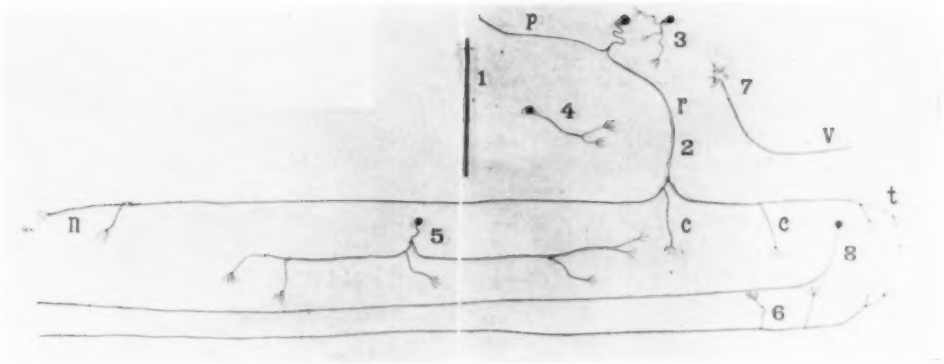

FIG. 2.

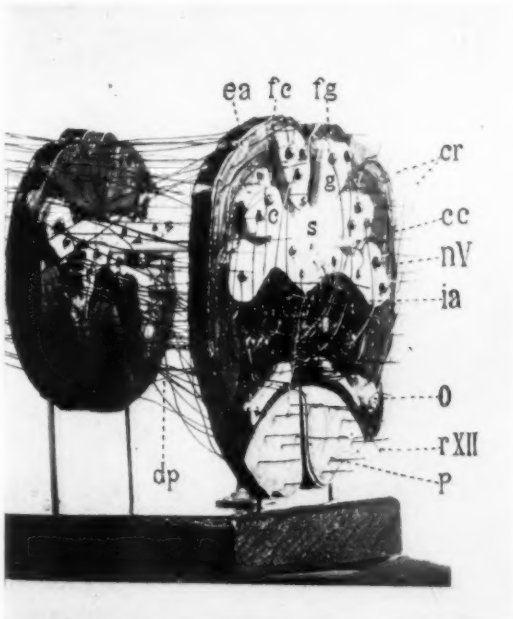

FIG. 3.

FIG. 1.—Photograph of model of spinal cord in partial profile. The Roman letters and numerals above the different sections indicate the regions and segments from which the sections represented were taken. *C* = cervical; *T* = thoracic; *L* = lumbar; *CM* = conus medullaris; *DP* = decussation of pyramids; *DL* = decussation of lemnisci; *B* = wooden base; *A* = upright supports to model with flange bases screwed upon wooden base with set-screw adjustments at top through which runs the brass tube *CC* (representing the central canal); *S* = upright supports of steel rod, two for each section (same as No. 1 in Fig. 2); *G* = spinal ganglion with dorsal and ventral roots and beginning nerve trunk with dorsal division; *R* = ramus communicans; *P* = projection of wooden base upon which support for ganglion rests; *Py* = pyramidal fasciculi; *O* = tip of inferior olive; *Cr* = restiform body; *Nf* = nuclei of fasciculi gracilis and cuneatus.

FIG. 2.—Photograph illustrating the construction of some of the constituent neurones used in representing the fasciculi of the model shown in Fig. 1. No. 2 = Afferent or spinal ganglion neurone with *T*-shaped division near its cell-body and the *Y*-shaped division of its axone within the spinal cord; *p* = a portion of its peripheral process; *r* = the axone as contributing to the dorsal root; *c* = collaterals with their telodendria; *t* = final termination of caudad division; *n* = termination in nucleus fasciculi cuneati, for example. No. 3 = Dogiel spinal ganglion neurone of Type I[1]. No. 4 = commissural neurone of short transverse course in gray substance of cord. Forms similar to Nos. 3 and 4 were used to illustrate Golgi neurones of Type II. No. 5 = association neurone of medium long course. No. 6 = axone of pyramidal neurone, the majority of which in threading them into the model were bent across the mid-line at the level of the decussation of the pyramids; others were made to decussate at lower levels. No. 7 = motor neurone of ventral horn with ventral root portion of its axone (*v*). No. 8 = neurone of nucleus dorsalis (Clarke's column), the axone of which extends through fasciculus cerebello-spinalis lateralis to corpus restiforme. No. 1 = form of smaller support indicated by *S* in Fig. 1.

FIG. 3.—Photograph of section of model at level of beginning decussation of the lemnisci. *cc* = central canal; *cr* = restiform body; *c* = nucleus of funiculus cuneatus; *fc* = funiculus cuneatus; *g* = nucleus funiculus gracilis; *fg* = funiculus gracilis; *dp* = decussation of pyramids; *ia* = internal arcuate fibers and decussation of pyramids; *ea* = external arcuate fibers (in two colors); *o* = inferior tip of inferior olive; *p* = pyramid; *rXII* = root fiber of XIIth nerve; *s* = central gray substance; *nV* = nucleus of spinal tract of trigeminus.

respective rods touched when it was held in place. The section was then fitted firmly upon the rods till the washers came in contact with the edge. The copper washers being malleable, they were bent with forceps beforehand so as to conform to the contour resting upon them. When all the sections were in their places on the supports, *s*, the tube *cc* was passed through them and through the eyes in the supports, *A*, at the same time and the set-screws were run down to grip the tube firmly and permanently. The section representing the conus medullaris, *Cm*, does not necessarily require supports.

An extra support similar to the supports, *A*, was necessary for holding the spinal ganglion in position. Though the nerve roots were naturally flexed caudad, yet the spinal ganglion and beginning nerve trunk necessarily extended some distance from the line of the sections. To avoid a too wide and clumsy baseboard, a projection, *P*, was attached to the base for the support of the ganglion. The position of this and the position of the upright screwed upon it was best determined after the sections were in place. Then the nerve roots were fused in position upon the section and the whole was securely attached to the upright by means of staples of small copper wire driven through the ganglion and the ends twisted upon the upright.

(7) When the various parts were in position on the supports and arranged permanently, the model was ready for stringing in the nerve fasciculi. In constructing these, No. 18 copper wire was used for the axones, supplemented by No. 1 wire picture cord for the collateral branches and final terminations with their telodendria. The lengths of wire required varied, of course, according to the locality at which an axone in question originated or terminated. Practically no duplications were allowed lest the model should appear too bewilderingly complicated. Therefore, each axone was measured off, constructed, and fitted in individually. In representing collaterals, a piece of picture wire was cut the required length, twisted tightly, the threads at one end slightly frayed and clasped upon the axone wire and then soldered in place. Soldering them not only insured their remaining firmly in whatever position they were placed, but it improved the appearance of the result, and, if the solder resulted in a slight varicosity at the point of junction, such was considered nothing more than the frequent natural appearance of axones as seen after the Golgi method. The soldering process was very rapid and simple. Drops of molten solder were allowed to fall upon the table from a height of 12 or 15 inches, and upon striking they flattened out and cooled as thin plates. These were cut into narrow strips about half an inch long. The junction of the copper wire and the picture wire (clasped upon it) was treated with a touch of acid zinc chloride, then one of the strips of solder was wound upon the junction, and a second over a Bunsen flame was sufficient. When it was necessary for collaterals to occur on an axone on both sides of a section through which the axone had been strung, such collaterals had to be put on after the axone was in place. This was done by simply attaching the collateral in the same way, after the stringing in, and then holding a spirit lamp or Bunsen burner under the point of junction. The final terminations of the axones were represented by soldering the piece of picture wire upon the copper wire end to end. These points of junction were dressed with a file and then could be easily passed through the holes in the sections, and so all were attached before stringing in, because it could be done much more easily when holding the two pieces upon the flat surface of the table. As is evident, the picture wire was used in order to represent the end-brushes or telodendria. No. 1 picture wire is composed of 8 strands. These could be frayed out, clipped, and bent so as to resemble any form of end-brush usually seen.

To represent bifurcations of the axone proper, as is the case in the spinal ganglion neurone, for example, an extra piece of copper wire was soldered on to the main portion of the axone and the junction bent in any angle desired. Bifurcations in the region of the final termination were accomplished by either soldering on an extra piece of picture wire or by dividing the threads of the terminal picture wire into two equal numbers, twisting each number into separate wires, and making end-brushes on each as before. The results of both procedures are shown in Nos. 2 and 5 of Fig. 2.

Axones of short course were made wholly of picture wire. For Dogiel spinal ganglion neurones of Type II, for example (No. 3, Fig. 2), the wire was doubled and then divided into as many branches as desired, each twisted into a separate wire and frayed at the end. Golgi cells of Type II were made in the same way. Connections of the sympathetic system were represented by a piece of picture wire passing through the ramus communicans into the nerve trunk and thence into the confines of the spinal ganglion, there to break up into divisions, one of which terminated about a Dogiel cell of Type II, others about spinal ganglion cell bodies of the ordinary Ranvier type. In response, a ventral root axone passes into the domain of the sympathetic via the ramus.

The small copper wire being very flexible, it could be drawn through the holes prepared for a given fasciculus with almost as much ease as string, and it is much better than string in that it and the collaterals remain as arranged. It does not sag and, combined, it adds considerably to the rigidity of the model. As shown in the illustrations of several of the types of neurones given in Fig. 2, Nos. 2 and 5 could not be used in the model, since they have certain collaterals that could only be attached after the wire has been threaded through the holes in the wax sections. Also, such axones as have their cell bodies within the spinal cord are shown in Fig. 2 as equipped with them, when, it will be remembered, the cell-bodies were attached to the sections before they were put up in series and the axones threaded in. The beads (cell bodies) are only added in Fig. 2 to complete the appearance of the neurones presented. In making the model each axone was threaded in bare of a cell body, was arranged as to its end of origin with special reference to its appropriate cell body, was then clipped the required length and the end inserted into the eye of the bead. To further insure both the end of origin and the bead remaining in position, a fine wire staple was placed astride

the wire close up to the bead and driven into the wax section. When the wires were painted this staple became invisible. The ventral horn neurones alone were put in position with the cell bodies already attached to the axones. The end-brushes or telodendria were made to clasp appropriate cell bodies in a neurone chain by simply bending the twigs about a bead and pressing the ends of some of them into the wax and the arrangement held in place by the use of the fine wire staple when necessary.

Great architectural detail was necessarily avoided to maintain the simplicity and usefulness of the model. Only the simpler and most generally accepted arrangements of neurones were undertaken. In case of Helweg's fasciculus, which is claimed to be a spinal cord-olive connection but the locality of the cells of origin of which is uncertain, only plain, straight wires were used piercing the first section in the region of the olivary nucleus and extending into the cervical region of the cord where they were simply cut off without indications of either origin or termination. Fig. 3 gives an idea of the number of architectural arrangements undertaken at the more complicated level of the beginning of the olivary nucleus and the decussations of the lemnisci. The mere explanation of the figure will suffice for the description of the construction. The color detail is, of course, not brought out in the photographs, the different shades of red, yellow, green, orange, and brown all taking dark and not distinguished from the black outlines of the fasciculi, while the grayish white and the blue alone show light. Association neurones with both their cells and fibers brown on a brown background show scarcely at all. Neither does the lemniscus, for example.

After the construction of the model was completed, it was carefully gone over with paint. Each fasciculus of wires was painted the color of the corresponding fasciculus outlined on the wax sections through which the wires run. Associational and commissural neurones and ventral horn neurones were given their respective colors. Injuries incurred in threading in the wires were repaired and the areas indicating fasciculi on the sections were repainted or touched up, according to necessity. The baseboard was given a thick coat of light yellow to light up and give contrast to the structure above, and the upright supports were given a light metallic luster with a coat of silver paint. Then after all was dry, the whole model was given two coats of transparent varnish to protect the colors and facilitate in dusting the model.

In painting the wires fine globules of paint would form on the twigs of the end-brushes. These globules resemble closely the varicosities seen upon these when stained by the Golgi method or by methylene blue, and so no attempt was made to avoid them.

THE REVEREND GERSHOM BULKELEY, OF CONNECTICUT, AN EMINENT CLERICAL PHYSICIAN.*

By Walter R. Steiner, M. D.

The interest aroused of late in the medical history of our own country has caused its study to throw much light on the early colonial period, and many former worthies have now become quite familiar to those of us, who cherish the past doings of our profession in the United States. There was, however, a class of eminent practitioners, flourishing chiefly in the seventeenth century, who have been somewhat slighted by Packard, Mumford and others. I refer to the clerical physicians, who were mostly to be found in New England. Some of these "there be which have no memorial," yet there are others of them, who "have left a name behind them that their praises might be reported," though, in many instances, their records are indeed quite fragmentary. In this latter group the name of Gershom Bulkeley stands out large and bold.

He was born in Concord, Mass., about the year 1635,[1] of distinguished parentage. For his father, the Rev. Peter Bulkeley, driven from England on account of his rigid nonconformity and "shut up"[2] in Concord, then a remote and inaccessible spot, was a man of great learning and piety, while his mother was the daughter of Sir Richard Chetwode. Reared, consequently, in the best of family surroundings, he was carefully educated and was graduated at Harvard College, with one other, in the class of 1655.[3] The Steward's book contains a full record of his expenses there from the time of his admission to the date of the rendering of his last quarter bill. Many interesting items are to be found in it, including one for "shoo-mending," and credits of rye, Indian "wheatt," "wheatte meall," butter, cheese, "appelles," "backen," "beaff," "turkey henes," "lambes," "sheepe," "on cow," "on oxe," "430 ft. bords," etc.[4]

Shortly after graduating he began to study for the ministry. He possibly, also, took up the study of medicine, but we

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[1] Chapin and Caulkins give 1636 as the year, while Shattuck and Chapman put it a year earlier, as above. Sibley cannot determine the exact date and says it was in 1635, 1636, or 1637.

[2] These were the words by which he expressed his seclusion. (See Shattuck. History of the Town of Concord, Mass. Boston, 1835, p. 158.)

[3] Sibley. Harvard Graduates. Cambridge, 1873, I, pp. 389-402.

[4] Sibley. *Op. cit.*, pp. 389-390.

have no information as to who his instructor was in either of these branches, or where he resided at that time. We imagine his father had much to do with his training at this period. In 1661, after several months' trial, the people at New London, Conn., made a contract with him by which he was "to become the minister of the town on a salary of eighty pounds yearly for three years" with the stipulation that it would then be increased if circumstances would permit.[5] During his first term of years he was to have "all such silver as is weekly contributed by strangers, to help towards the buying of books"[6] and the many volumes that still remain of his library show that he probably expended all of the money that thus came to him. His pastorate appears to have been for some years an eminently happy one. The salary was increased in 1664 to six score pound a year,[7] and about this time he brought his mother to New London to live. Everything pointed to his long service in the ministry of this town, but shortly thereafter some friction seems to have arisen, due, it appears, to his opposition to the half-way covenant.[8] On February 25, 1665, the town voted that "they were willing to leave Mr. Bulkley to the libertye of his conscience without compelling or enforcing him to anything in the execution of his place and office contraye to his light according to the laws of the commonwealth,"[9] and, some months later, the town "understanding Mr. Buckley's intention to goe into the Bay" sent messengers to him "in order to know Mr. Bulckley's mynde fullye."[10] Unfortunately he was determined to go in spite of all entreaties to remain, although he consented to occupy the pulpit until a successor was obtained.

He was invited, on June 1, 1666, by the church in Wethersfield "to come and to be helpful to us, and to settle among us in the work of the ministry."[11] This call was accepted and he served them well until he was obliged to resign early in 1677, probably "by reason of weakness of his voice." His resignation was accepted with the utmost reluctance by the town, who had previously declared themselves "freely willing to provide another minister to assist him, and to be a comfort and help to him in that work, and did declare it to be their desire that their Reverend pastor would afford them his help and advise and direction respecting a meet person for that work, for which they shall be thankful to him and take it into serious consideration."[12]

After his dismission from this church he retired from the ministry and devoted the remaining years of his life largely to the practice of medicine. Chapin says that he removed at this time to the other side of the Connecticut River and settled in the town of Glastonbury.[13] There seems to be some doubt as to this, as in his will he describes himself as from Wethersfield.[14] We know his favorite daughter Dorothy, the wife of Thomas Treat, lived in Glastonbury, and his long visits to her may have created the impression that he dwelt in the same town.

There is no record pertaining to his medical career before the time of King Phillip's War, but he must have had considerable attainments in medicine and surgery before this, as on October 20, 1675,[15] the Court ordered him "to be improued in this present expedition, to be chyrurgion to our army." He was also "ordered and impowered to be of the Council of War." Two months later the Colony's Council of War, showing its esteem for him, commissioned Major Treat, in command of the army, "to take speciall care of the Reverend Mr. Bulkly,"[16] and a little while later appointed two men to go to New London "to take care of and assist in the dressing of the wounded men there, whilst Mr. Buckly goeth forth with the army."[17] From January 26 to February 5, 1676, he was absent with Major Treat and his forces on an expedition against the Indians. About two weeks after their return another expedition was planned and Bulkeley was ordered "to hasten up to goe forth with the army."[18] While ranging through the woods, on this expedition, he was wounded in the thigh by the Indians, early in March, in the vicinity of Wachusett, now Princeton, Mass.[19] The wound, however, could not have been a serious one as Israel Chauncy, also a surgeon in the army, wishing to be relieved on account of sickness and death in his family, writes on March 27, "I hope my brother Bulkly provided he have an easy and able horse will attend the army on the present motion; only if it be expected he doth desire care may be taken for an easy horse, and that it may be sent him this night."[20]

Bulkeley seems to have gone on this third expedition, but must have returned to Wethersfield by May 13 for the Court, "then being informed that sundry wounded men are come to Mr. Buckly, desired Mr. Buckly to take the care and trouble of dressing the s[d] wounded souldiers till God bless his endeavoures with a cure; and Mr. Stone is desired and ordered to assist Mr. Bulkley in the works of the ministry so long as Mr. Bulkly shall be improved as before."[21] Two days later Connecticut raised a small number of men in the war against the Narragansetts and styled them an army with Major Talcott as their leader and Gershom Bulkeley as their

[5] Caulkins. History of New London. New London, 1852, p. 131.
[6] Caulkins. *Loc. cit.*
[7] Caulkins. *Op. cit.*, p. 136.
[8] Sibley. *Op. cit.*, p. 391.
[9] Caulkins. *Op. cit.*, p. 137.
[10] Caulkins. *Loc. cit.*
[11] Sibley. *Op. cit.*, p. 393.
[12] Adams. Historic Sketch of the First Church of Christ in Wethersfield. Hartford, 1877, p. 10.
[13] Chapin. Glastonbury for Two Hundred Years. Hartford, 1852, p. 40.
[14] Chapman. The Bulkeley Family. Hartford, 1875, p. 81.
[15] Conn. Coll. Records, II, p. 271.
[16] Conn. Coll. Records, II, p. 388.
[17] Conn. Coll. Records, II, pp. 399-400.
[18] Conn. Coll. Records, II, p. 409.
[19] Hubbard. The History of the Indian Wars in New England. Edited by S. G. Drake. Roxbury, 1865, I, p. 204.
[20] Fowler. Memorials of the Chaunceys. Boston, 1858, p. 280; and Conn. Coll. Records, II, p. 424.
[21] Conn. Coll. Records, II, p. 277.

"chirurgion." This time also Bulkeley was one of the army's Council of War.[22]

For these many services the Colony's Council of War showed its appreciation by allowing Bulkeley liberty, in 1676, to transport 60 bushels of corn to Boston "to purchass some necessaries and phissicall druggs"[23] and in the fall of the next year he was permitted to transport "two hundred of deere skinns out of this Colony this next yeare, any law to the contrary notwithstanding."[24] He wished the liberty to do this so that he could exchange the skins for medicines. Besides the above esteem, which the Council showed for his services, they returned to him their "hearty thankes," January 2, 1677, "for his good service to the country, this present war," and did "order the Treasurer to pay unto him the sume of thirty pounds as an acknowledgment of his good service to the country, besides the sattisfying of those that have supplyed his place in the ministry."[25]

After the war he had trouble in collecting his pay from Massachusetts for his care of Jonathan Welles, a wounded soldier, as he would not accept this state's proffered amount[26] and sued Major John Pynchon of Springfield, at the Hartford County Court, on his engagement that due care should be taken for payment of charges, medicine, etc., for Welles and obtained judgment for forty-nine pounds.[27] Massachusetts subsequently complained of the allowance and countenance of this suit by Connecticut,[28] and we do not know if Bulkeley ever received his pay.

Four of his medical account books remain and they all bear witness to the fact that his practice was a large one. I have seen three of them. The first one which I have consulted was his ledger which covered the years from 1680 to 1684. The second book was examined by Dr. G. W. Russell, of Hartford, some twelve years ago and was merely a portion of his day book for 1688, consisting only of twenty-eight pages and dating from August to December 31 of that year. The third covers the period from 1708 to 1713, while the last book, in the library of Trinity College, is well filled with visits paid and medicines and services administered to his various patients from 1702 until August 7, 1713. All of them show he had the same trouble in collecting his bills as doctors now experience. One of his bills was settled twenty-four years later and caused him to make the following remarks:

"But at last we have Reckoned on Aug. 27, 4. An. Dom: 1707 & he hath given me a bond for five pounds money payable at or before ye first day of March next ensuing wch is in full of all accounts between me & ——— from ye beginning of ye world to this day: & he hath kept such poor Accounts yt I remitted between 3 & 4 pounds in money, partly out of good will to him & partly to make sure yt he might have no wrong by me. He had no account of ye six pounds & nine shill. above mentioned, wch he had payed me by his brother Stephen, besides divers & many other other lesser particulars on both sides: but now this Account is all straightened & done well

G. Bulkley"

His patients came from a wide territory, as we find them consulting him from Wallingford, Farmington, Colchester, Killingworth, Middletown, Guilford, Hartford, New Haven, Haddam, Lebanon, Windsor, Wethersfield, Glastonbury, Rock Hill, New London and Derby in Connecticut, and from Springfield and Northampton in Massachusetts. The names therein entered show he treated some of the best families in the State, for we find mention of the Walcotts of Windsor the Griswolds of Lyme, the Pitkins, Hayneses and Wyllises of Hartford, the Hills of Guilford and many others.

The handwriting in these books is somewhat illegible and the various symbols, then employed, render it exceedingly difficult to decipher some portions. We learn he dispensed the "sovereigne remedy" Rubila of John Winthrop, Jr., but we doubt whether he knew its composition as its worthy maker was very careful in keeping its ingredients secret. In one place Bulkeley charges Mr. Peter Bulkeley 6 shillings for half an ounce of this medicine. As I have previously shown,[29] two grains was the average dose, and Peter Bulkeley must have obtained this quantity for several subsequent dispensings. The usual price for this remedy appears to have been two shillings per grain. On one occasion one patient was charged 2 shillings and 8 pence for 6 grains of the Rubila, and may have taken it as one dose, for Mrs. Davenport of New Haven once took that amount, although it was an unusual quantity. Another patient of Bulkeley's, however, holds the record for taking heroic doses of this drug. We read the following in a letter Fitz-John Winthrop wrote to his brother Wait about their sister Lucy:[30] "I found my poor sister ill with ye beginnings of a feavour wch every day encreased upon hir: thre dayes after I persuaded hir to take 10 graynes of rubila, wch wrought twice, but ye malignety of ye feavour was little abated; ye second day after she complayned of oppression at hir stomack, & desired a litle vomiting drink. I gave hir 16 graynes but did not work; an houre after she toock 5 more, wch wrought twice; at night she toock a potion of ye black powder & rested a litle; but ye feavour allwayes upon hir without any intermission, & she grew weaker every day. Thre dayes since I advised to send for Mr. Buckly who came ye next day & gave hir such things as he thought suitable but noething abated ye feavour & she is now quite gon to all hope, & can onely be recovered by a miracle from Heaven." Unfortunately this miracle was not forthcoming and she died five days later.

With all these patients, many of whom he treated before 1686, it seems strange that he was not licensed to practise medicine until October 14 of that year. The license then issued reads: "This Court being well acquainted with the

[22] Conn. Coll. Records, II, p. 444.
[23] Conn. Coll. Records, II, p. 433.
[24] Conn. Coll. Records, II, p. 325.
[25] Conn. Coll. Records, II, p. 483.
[26] Conn. Coll. Records, V, p. 282.
[27] Conn. Coll. Records, III, p. 510.
[28] Mass. Records, V, p. 318.
[29] Steiner. Governor John Winthrop, Jr., of Connecticut, as a Physician. Johns Hopkins Hosp. Bull., 1903, XIV, p. 302.
[30] V. Mass. Hist. Coll., VIII, p. 281.

ability, skill and knowledge of Mr. Gershom Bulckley in the arts of phissick and chirurgery, doe grant him full and free liberty and license to practise in the administration of phissick and chirurgerie as there shall be occassion and he shall be capable to attend."[31] It is hard to find a reason for this long delay, but it has been suggested that he might have been denied before this "the legal power to collect his professional fees, as he was not sanctioned by authority."[32]

His library is now much scattered and destroyed, but a number of books and manuscripts yet remain. Some are in the possession of Trinity College, while others are owned by Dr. G. W. Russell of Hartford. His manuscripts show that he was in the habit of making abstracts of important articles and books he did not own, and was constantly recording prescriptions and remedies said to be effectual by members of his profession or the laity. It will suffice to quote five of them.

Against the Wind Collicke

"A Receipt agt ye wind Collicke, sent by (my now ffather in Law) Mr. Charles Chauncey then of Situate, May 3, 1648, to my own ffather Mr. Peter Bulkeley of Concord, for my mother, who was wont to be much troubled with ye wind Collicke. The Recp. is this When she hath the fits in any extremity, Take a thicke toste of white bread, toste it thorwly & leisurely on both sides browne; in the meane time heate half a pint of muscadine or somewhat more (or for want thereof, of sacke) on a pewter dish upon a chafing dish of water, very hot, and put ye dry toste into it, & let it drinke up as mch of ye muscadine (or sacke) over ye coales as it will receive, & let this toste be applied as hot to her navill as she can possible endure it, & let it ly on till it be cold. Muscadine (if it can be gotten) is more effectual than sacke, & never failing in ye disease, yt I could find; but ye other (viz. sacke) gives speedy ease through God's blessing."

His other remedy for this affection does not sound so attractive.

℞ Wolfes gutts cleansed from ye filth, then washed over and over in odoriferous wine wherein wormwood hath been boiled, dry them in ye north wind, one dram of ye powder of ye guts, so prepared in 3iii of wine or more (after a clyster given) is an excellent remedy for ye extreme paines of ye wind Collicke.

Hysterical fits were thus treated:

℞ Wolfes flesh, salt it, 3i thereof dissolved in aqua hysterical & epileptical. q. s. is no less effectual against hysterical ffitts, the pty then wearing a little piece of ye same about her.

For violent paine in the stomach and bowels, together with invincible costiveness, he employed this prescription, given him by a Hartford blacksmith.

Violent paine in the stomach & bowells together with invincible costiveness

℞ Elicampane, Licoras, brimstone & burnt alum, of each an equal quantity powder them & mix them with a little sallet oile & Rume to the thickness of an electuary, & take ye quantity of a small nutmeg, it is a singular remedy for ye violent paine of ye stomach and bowells accompanyed with invincible costiveness, loosen ye body & ease the paine when nothing else yt could be gotten would do it, uti saepius pbatum a Josepho Nash Hartfordiensi fabro, a quo accepi.

The following remedy of Thomas Thacher's for indigestion is of interest, for he was the author of a "Brief Rule to Guide the Common People of New England. How to Order Themselves and Theirs in the Small Pocks or Measels"—the first medical publication in this country.

℞ a wine cup of Baume water in ye cold still drawn from ye herb a comon wine cup full, & of Brandy one spoonful in ye morning fasting: Then for breakfast two hours after take spring water a pint and dip in it a good slice of manchet: what bread & water you please thus soaked eat for breakfast, at dinner do ye same & at supper also, pr palpitatione Cordis prbatur, ex propria eperentia Mri Thomae Thatcher ecclesiae 3tiae Bostoniensis (in N. A.) Pastoris qui superaddit. Thus have I done twice since I came to Boston, & if I have any fit at night I take ye water and brandy in ye morning. I used no drugs. This receipt of Mr. Thatcher's I received from Mr. Bradstreete of N. London under Mr. Thatchers owne hand, this 3, 5, 1672.[33]

Bulkeley's breadth of view and diagnostic acumen are well shown in two instances which have come down to us. The first one relates to his opinion in regard to Mary Brown of Wallingford, who was being tried for the murder of her son. "She had been subject to paroxysms of insanity and the court and the jury were in some perplexity relative to their own course of proceeding." They consequently applied to Mr. Bulkeley, who showed his sound sense in the following: "If she were not compos mentis at the time of the fact it is no felony and consequently no willful or malicious murder; and if she be known to be a lunatic, though she have her lucid intervals, there need be very good and satisfactory proof that she was compos mentis for the law favors life."[34]

The second instance relates to Abigail Thompson of Farmington, who was accused of killing her husband by throwing a pair of shears at him, in a fit of anger, thus causing a wound from which he died. Bulkeley writes: "I find yt ye womans act was in ye nature of a chance medley, done in a quarrell, upon a sudden provocation; and also yt ye man lived 18 days after ye wound, was up and down, here and there, cut wood, dressed flax, &c., all weathers; and yt in all this time no care was taken of him by any of his neighbors or relations, his wound was never searched, no proper means at all used for his cure, nothing but a plaster applyed, wch skinned it over 3 or 4 days before he dyed; and in fine, nobody abiding in ye house with them night or day, but he was wholly left to the mercy, care and nursing of that bloody woman, who they knew had wounded him. Hereupon my little sense concludes that ye wound, penetrating into ye brain, was indeed such yt he might possibly dyed of it, but the neglect of it and ye (illegible) method of cure was such

[31] Conn. Coll. Records, III, p. 218.

[32] Russell. Early Medicine and Early Medical Men in Connecticut. Proc. Conn. Med. Soc., Bridgeport, 1892, p. 28. Dr. Russell gives an excellent account of Gershom Bulkeley.

[33] The above selections are taken from those given by Russell in his article previously cited. They are to be found in the original in a manuscript volume of Bulkeley's, now owned by Dr. G. W. Russell. I am greatly indebted to Dr. Russell, as he allowed me to consult this volume.

[34] Sumner. Address on the Early Physicians of Connecticut. Hartford, 1851, p. 28.

that he must of necessity dy of them, and tis impossible to make it evident yt he died of ye wound. I cannot say ye wound would have been cured if good means had been seasonably used; but I can say it is probable it might have been cured, because more dangerous wounds of ye brain than that have been cured. It neither is or can be evident that he died of ye wound; but I think tis evident yt he died of corruption, gangrene and suppuration of ye wound and brain, through ye neglect of means to prevent it, w^ch^ in an ordinary way of Providence, might have been done. Tis now endeavored to lay ye fault of ye neglect upon ye woman. I cannot excuse her, any more than ye man or his friends. I think y^y^ all are to blame; but besides else may be said to avoid it, tis certain she was not indicted, or brought to answer, on that account, and we must not indict upon one crime and evidence for another." [35]

His knowledge of chemistry was most profound and his laboratory was well stocked with apparatus and chemicals. "Even to alchemy with its visionary speculations, then so closely allied to chemistry, he seems to have paid considerable attention. He was master of several languages among which may be reckoned the Greek, Latin and Dutch." [36] Besides theology and medicine he was skilled in the knowledge of law and was a politician in the noblest sense of that word. He was on the losing side, however, for his loyalty was of the "high tory and passive obedience type" [37] so he was an ardent advocate of Sir Edmund Andross, by whom he was made a Justice of the Peace in 1687.[38] His pamphlets entitled "The People's Right to Election" and "Will and Doom" attest his firm belief in the divine right of kings, and when the Connecticut charter was resumed in 1689, his position on Andross' side caused him to lose much in public favor. He had previously refused to take the freeman's oath, so he was denied a seat among the deputies, although he was elected as one from Wethersfield in 1679.[39]

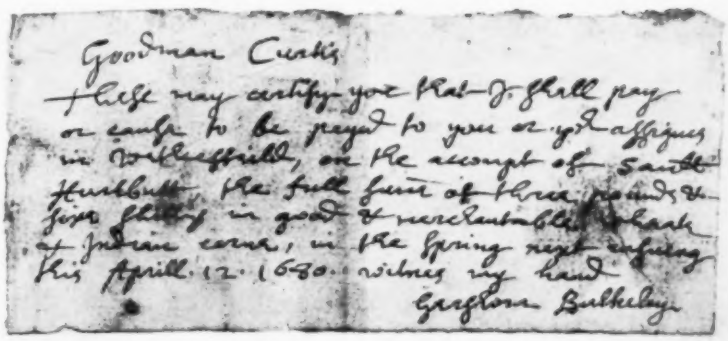
Ill health caused him to visit Antigua, in the West Indies, with his son Charles, in 1681.[40] Eight years later, in one of his pamphlets he speaks of his "bodily infirmity," [41] while in his will he says: "I have much more than twenty years walked upon the very mouth of the grave, under so great infirmity that I cannot but wonder how I have all the while escape falling into it." [42] Yet in spite of his ill health he was able to continue in the practice of medicine until his death, at the age of seventy-seven, on December 2, 1713. He was buried in the cemetery back of the Congregational Church in Wethersfield, and upon his tomb the following inscription can yet be deciphered:

"HE WAS HONORABLE IN HIS DESCENT,
OF RARE ABILITIES, EXCELLENT IN LEARNING,
MASTER OF MANY LANGUAGES,
EXQUISITE IN HIS SKILL
IN DIVINITY, PHYSIC AND LAW
AND OF A MOST EXEMPLARY
AND
CHRISTIAN LIFE
IN CERTAM SPEM BEATAE RESURRECTIONIS REPOSITUS" [43]

His will was dated May 26, 1712, and in its first clause he states his occupation was that of a "practitioner of physick." In it we also find the following: "Item, to my grandson Richard Treat, (the son of Thomas and Dorothy) I give and bequeath all my books and manuscripts, which anyway concern medicine and chymistry, among which I include all Glauber's and Boyle's Books, which I have, whether in Latin or English, as also Georgius Agricola De Re Metallica and Lazarus, each re-translated by St. John Pettus called Fleeta Mina, or the art &c of Metalls; and the same St. John Pettus his Fodine Regales, and such like books, and also Littleton's Dictionary for the Latin tongue, and my Dutch Grammar for the Dutch language, together with my manuscript Dutch Dictionary which may help him to read and understand Hehwart's Degerend, &c., i. e. the Day Spring, a new resurrection of the art of medicine which book is in the Dutch language, and together with all my vessels and instruments useful thereabout, of glass, brass, copper, iron, stone or earth. All these I give to him, provided he hold and pursue his inclination to that study, but if by death or otherwise he be diverted or depart from it, then I give all to the next of his bretheren that will apply himself to the study, but if none of them, then I give them all to his mother (my daughter Dorothy) to dispose of at her discretion or to his father, in like manner, if he survive her." [44]

Various estimates are given of his character. Chauncy writes in 1721: "I have heard (him) mentioned as a truly great man, and eminent for his skill in chemistry" [45] and Benjamin Trumbull says "Mr. Bulkley was viewed as one of the greatest physicians and surgeons then in Connecticut." [46] Later writers as John Hammond Trumbull and Palfrey somewhat detract from previous estimates of him. The former states "he had few superiors in the colony in natural ability, professional learning or general scholarship" but adds "overweening self importance, obstinate adherence to his own opinions or prejudices, a litigious spirit and the peculiarities of his political creed, detracted from his usefulness, and kept him almost continually at strife with his parish, his neighbors or the government of the colony." [47] While Palfrey

[35] VI Mass. Hist. Coll., III, p. 399.
[36] Chapin. *Loc. cit.*
[37] Conn. Coll. Records, III, p. 389.
[38] Conn. Coll. Records, III, pp. 455 and 457; and Hoadley, Coll. Conn. Hist. Soc., Hartford, 1895, III, p. 73.
[39] Conn. Coll. Records, III, p. 26.
[40] Hoadley. Coll. Conn. Hist. Soc. Hartford, 1895, III, p. 71.
[41] Coll. Conn. Hist. Soc. Hartford, 1860, I, p. 59.
[42] Chapman. *Loc. cit.*
[43] Tillotson. Wethersfield Inscriptions. Hartford, 1899, p. 30.
[44] Chapman. *Op. cit.*, p. 84.
[45] Mass. Hist. Coll., X, p. 155.
[46] Trumbull. History of Connecticut. New London, 1898, I, p. 291.
[47] Conn. Coll. Records, III, pp. 388-389.



Goodman Curtis

These may certify you that I shall pay or cause to be payed to you or yor assignes in Wallingford, on the accompt of Samll Hubbell the full sum of three pounds & four shillings in good & merchantable wheate & Indian corne, in the spring next ensuing this Aprill 12. 1680. witnes my hand

Gershom Bulkeley

Holograph Note and Signature of Gershom Bulkeley.

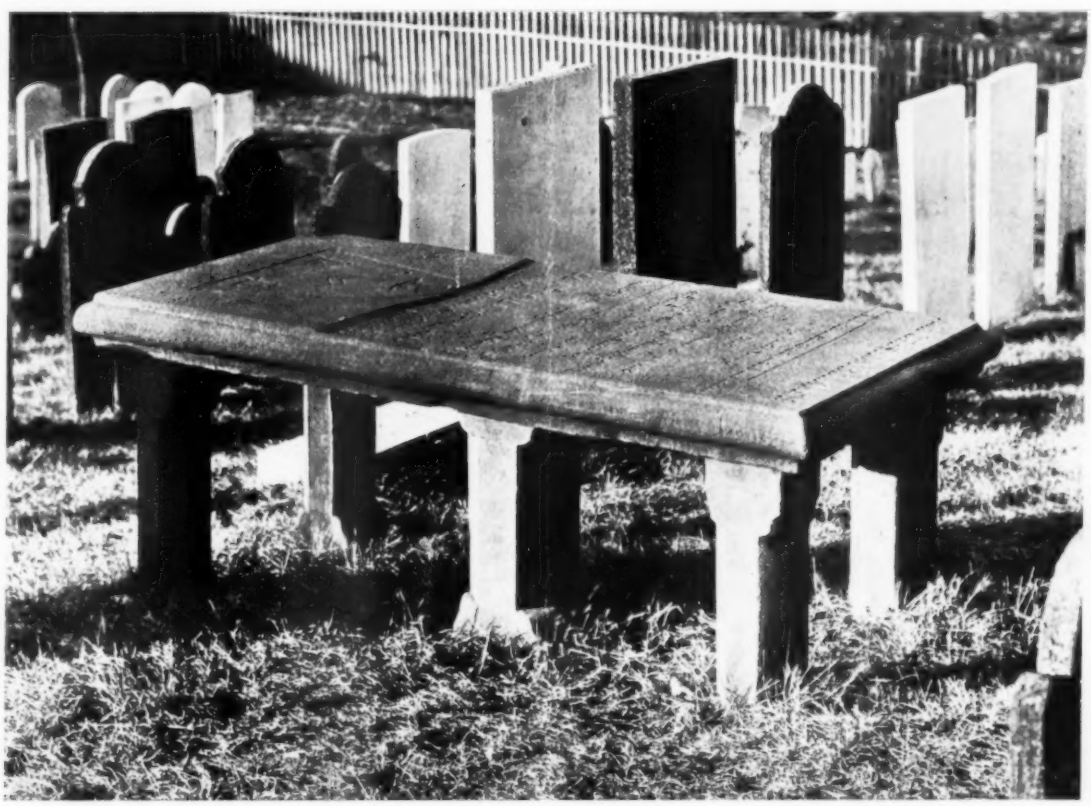


Table Monument, Gershom Bulkeley, showing the Coat-of-Arms of the Bulkeley Family.

notes "He was always a discontented and troublesome person."[48] A contemporary opinion of him is to be found in the Boston News Letter for December 28, 1713. Here we read "he was Eminent for his great Parts, both Natural and Acquired, being Universally acknowledged besides his good Religion and Vertue to be a Person of Great Penetration, and a sound Judgment, as well in Divinity as Politicks and Physick; having served his Country many years successively as a Minister, a Judge and a Physician with great Honour to himself and advantage to others."[49]

I shall feel that my labors have been rewarded in thus bringing before you Gershom Bulkeley, numbered among those "Persons whose more declared Business was the Study of Divinity,"[50] if he shall henceforth find, at least, slight mention in subsequent accounts of colonial medicine in this country.

[48] Palfrey. History of New England. Boston, 1864, III, p. 544.

[49] Sibley. *Op. cit.*, p. 397.

[50] Mather. Magnalia. Hartford, 1853, I, p. 493.

A SKETCH OF THE LIVES OF A GERMAN AND AN AMERICAN MASTER OF SURGERY.[1]

BY MARTIN B. TINKER, S. B., M. D.,

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It has often seemed to me that the rewards in honor and lasting fame which we bestow upon our eminent men are not quite fairly distributed. The men who laboriously glean from accumulated knowledge the facts most important and useful in present day practice, who seek underlying principles, who simplify and systematize, are often far less widely known and honored than the men who make some discovery of relatively slight importance, describe some anatomical point, invent a new instrument, or devote their lives to the development of some one method of treatment. Some of our most truly great men who have deeply influenced their students, associates, and the ideals and practice of their day have not startled the world with anything new. What such men accomplish does not make their names immortal but they inspire others; they transmit less of their knowledge than of their enthusiasm and methods of work. A few facts about the lives of two men of this stamp I shall attempt to give this evening.

Bernhard Rudolph Conrad Langenbeck was born November 8, 1810, at Padingbüttel, a town located on the coast of the North Sea near the mouth of the Weser. His father was a clergyman of much ability, who also kept a private school in which Langenbeck was educated for the first seventeen years of his life entirely under his father's private teaching. His early studies were intended to prepare him for entering the ministry. After leaving his father's school he entered an advanced class in the gymnasium at Hildesheim where he further pursued studies in preparation for theology. On October 25, 1830, he matriculated in the medical department of the University of Göttingen, where his uncle was Professor of Surgery and Anatomy. He passed his examinations for the doctorate *cum laude*, and April 17, 1834, presented for his graduating dissertation a paper on *The Structure of the Retina*. A further paper, *De Retina, Observationes Anatomico-pathologicae*, for which the Blummbach stipendium was awarded him in 1836, permitted him to take a scientific journey to Paris and England. After two years' study he returned and was made Privat-docent in physiology and pathological anatomy at the University of Göttingen, May 7, 1838. He gave instruction in both of these branches as well as in embryology for three years and with such success that in 1841 he was made Associate Professor of Pathological Anatomy. The change from physiology and pathology to surgery was influenced, Bergmann tells us, by three factors: In the first place he was offered a position as assistant to his uncle who at that time was Professor of Anatomy and Surgery in the University of Göttingen. The advantages for practical surgical work which he gained in that way were great and he developed a strong liking for surgery as well as an excellent foundation for it from a thorough study of anatomy. The second great influence which led him to take up surgery was his journey to England, where he saw the most eminent surgeons of that time and where he came into specially intimate contact with Astley Cooper. The collections in the museums of such hospitals as St. Thomas's in London were then unequaled in Germany and the brilliant sessions of the Royal Medico-Chirurgical Society greatly stimulated his interest in surgery. A third important factor was an acquaintance with Stromeyer, then Professor of Surgery in Erlangen, which Langenbeck made when attending the meeting of the National Natural History Society at Erlangen. Stromeyer was soon called to the chair of Surgery in Munich and he strongly recommended Langenbeck as his successor. Although he did not accept the chair at Erlangen this brought Langenbeck's name into prominence and, no

[1] Read before the Johns Hopkins Hospital Historical Club, February 8, 1904.

doubt, had an influence in securing him the professorship of surgery in Kiel one year later in 1842. During the six years spent in Kiel he established so high a reputation as an operator and teacher of surgery that at Dieffenbach's death he was called to Berlin as his successor. He spent thirty-four most productive years in Berlin, building up the Royal Surgical Clinic from a comparatively unimportant institution of twenty beds to one of the most important clinics in Europe, founding and editing the *Archiv für klinische Chirurgie*, founding and presiding over the German Surgical Association and teaching with such success that students flocked to his clinics and operative courses from many lands. When seventy-two years old, in 1882, Langenbeck resigned from active work and thought to spend the balance of his days in peace and comfort in his beautiful country place near the Rhine. But this was not to be: a severe eye disease (probably cataract) required repeated operations, and the death of members of his family filled his last days with trouble and sadness. He died at Wiesbaden in his seventy-seventh year, October 8, 1887.

As a surgeon he was noted for the perfection of his operative technic and his consideration for his patients. He is said never to have used an unnecessary or unkind word in his dealings with his patients or his assistants and nothing was looked upon lightly which concerned the comfort or welfare of his patients. His knowledge of anatomy and constant teaching of operative surgery on the cadaver no doubt contributed to his skill and accuracy as an operator. His constant endeavor was to simplify surgical methods and to learn general principles. As a military surgeon few men have had such wide experience or have used it so well. During the war between Germany and Denmark, in 1848, he served as surgeon in charge of the general army corps of the Dukedom of Schleswig-Holstein and then performed the first large series of joint resections in the history of surgery. He also served in the war between Austria and Prussia in 1866 and in the Franco-Prussian war of 1870. He was honored with numerous decorations and made many contributions of importance in military surgery, especially on matters concerning the sanitary arrangements of the German army, which may serve as a model on this subject for all time. In the Franco-Prussian War he organized a society of military hospital surgeons of all nationalities who met at frequent intervals and gave each other the benefit of their rich experiences. As an evidence of his success as a practicing surgeon it may be mentioned that when he entered the surgical clinic at Berlin there were scarcely twenty beds at his disposal; when he resigned his position to retire to Wiesbaden there was accommodation for over two hundred in his clinic and patients came to him from the entire civilized world.

Undoubtedly Langenbeck's influence was felt most strongly as a teacher. From the beginning, when in 1838 he was made privat-docent of physiology and pathological anatomy in Göttingen, his ability was recognized and this led to his promotion to *'ausserordentlich professor'* in pathological anatomy three years later, in 1841. In the spring term of 1842 he began his lectures in Kiel on Clinical, General and Operative Surgery, and while in Kiel he became widely known by the "worth and scientific spirit of his writing, his talent as an operator, and his gift as a lecturer on surgery." In the autumn of 1848 he began his clinical lectures in Berlin as successor to Dieffenbach and for thirty-four years he was the undisputed master of surgery in Berlin. He introduced the teaching of operative surgery on the cadaver, a training for students of even more importance than at the present, for in those days all operating had to be done without anesthesia. Bergmann says of his teaching that he was distinguished not so much by the brilliancy of his lectures as by their earnestness. In his clinical lectures he was most thorough and he presented the features of the case in clear and direct language which seldom failed to impress his hearers. His most gifted students were chosen as assistants and when once appointed they were never unkindly criticized but always praised for good work: lack of praise he said was as bad as the sharpest criticism. He frequently gave hints on problems for research but never extended advice, which he said ruined the individuality and originality of men.

The importance of his influence as a teacher is perhaps best appreciated when we mention the names of a few of his pupils and assistants who have attained eminence as surgeons and teachers of surgery: Bergmann, Gurlt, Sonnenburg: professors of surgery at Berlin, Trendelenburg at Leipzig. Küster at Marburg, Schede at Bonn, Lücke at Bern, and, master among masters, Billroth of Vienna. Of Langenbeck's surgical grandchildren, the pupils of his pupils, may be mentioned Lücke's student, Kocher of Bern, and Billroth's many students, including Mikulicz of Breslau, Czerny of Heidelberg, Eiselsberg and Gussenbauer of Vienna, Wölfler of Prag, Krönlein of Zürich and v. Hacker of Graz. In 1880, when he celebrated his seventieth birthday, his former assistants congregated from far and near and in the number were sixteen who were professors of surgery or directors of surgical clinics who had either previously acted as his assistants or had been his scholars. Through his activity in societies he was also a great teacher; he appreciated the great value of such meetings for interchange of ideas and was always prominent in their support. The founding of the German Surgical Society was entirely his work and he was its president for many years. For twelve years he was president of the Berlin Medical Society and when he left Berlin to take up his home for the last years of his life in Wiesbaden he was made honorary president of both of these societies.

Speaking of the character and influence of his work Bergmann, in his reminiscences of Langenbeck, says of him that he did not belong to the class of men who introduce startling new ideas or new methods of thought or who discover unsuspected treasures of knowledge. He deserves credit especially for emphasizing the bearing of the fundamental biological branches of medicine on surgery. In this way he stamped German surgery with a peculiar individuality and

first placed it among the great schools of the surgery of the world. No other surgeon has had such an influence on investigation and the practical results following it as he. To understand the significance of his work it should be remembered that at the time of his appointment at Berlin the surgeons of Germany ranked far below those of France and England. Modern German surgery has outstripped its western neighbors largely as the result of the labors of Langenbeck. Until the beginning of the first decade of the nineteenth century the part which Germany had taken in the advance of surgery was very unimportant. It had no names to compare with Pare, Petit, Desault, Dupuytren in France, or of Potts, Cooper, and John Hunter in England. Even Dieffenbach's plastic method is called to-day the "French method" and with some right for it was first demonstrated in Paris and described in the French language. Küster also calls attention to the wonderful progress in the teaching and practice of surgery which began with Langenbeck's career, and states that up to that time all German surgeons were obliged to leave their own country to get the most advanced teaching to complete their surgical education. The present-day student at the University of Berlin has early pointed out to him the Langenbeck Haus, erected in his memory by his sovereign and the fellows of the German Surgical Association. This fine building, erected on the banks of the Spree, is the home of the German Surgical Association, of the Berlin Medical Society, and of a fine library which includes Langenbeck's collection. It is one of the finest memorials and perhaps the most fitting, ever erected to a member of our profession.

In an obituary notice Langenbeck's most eminent pupil, Billroth, said of him: "It is impossible to sketch briefly the significance of his work; this would be to sketch the history of surgery for the past forty years. There was a charm in his personality which captured all who came in contact with him. He was the inspired and inspiring leader, the embodiment of an ideal clinical teacher. He has left his name in golden letters not only in the book of the history of surgery but in the book of love of his scholars and friends."

I will now recall to your memories some facts regarding an American contemporary of Langenbeck. Samuel David Gross was born the eighth of July, 1805, on his father's farm within two miles of Easton, Pennsylvania. His grandparents had emigrated from the region of the lower Rhine, in Germany, and settled in Pennsylvania. His early years were spent on the farm, near which he attended school in a log-cabin school house. He tells us in his autobiography that as a boy he was careless and more devoted to amusement than to study. About the age of six years he conceived the idea of becoming a physician and from this purpose he never swerved. He was brought up in a German settlement where little English was spoken, and at the age of fifteen his knowledge of English was slight. At that time he had made considerable progress in the German language, so that he had read a number of books and was able to write German with some facility. At the age of seventeen he commenced the study of medicine with a country practitioner, but finding that he had not sufficient education to enable him to understand the technicalities of medicine, he gave up his cherished plan and devoted two more years to preliminary study at the Wilkesbarre Academy and the Lawrenceville (New Jersey) High School.

When nineteen years old he began the study of medicine again with Dr. Joseph Swift of Easton, and soon afterwards he matriculated at the newly established Jefferson Medical College of Philadelphia. He was influenced to do this by the reports of the brilliant achievements of Dr. George McClellan, who was at that time professor of surgery, and soon after going to Philadelphia he became a private pupil of Dr. McClellan. As a student he states that he was very fond of practical anatomy and spent a large part of his time in the dissecting room. He graduated in 1828, when twenty-three years of age, devoting much care and labor to a thesis on *The Nature and Treatment of Cataract*. It is interesting to note that both Langenbeck and Gross were early interested in the eye, and both wrote their graduating thesis on subjects relating to ophthalmology.

Soon after graduation he opened an office in Philadelphia and for eighteen months eked out a livelihood, mainly by translating books from the German and French. He states that during the first year his income from practice did not exceed three hundred dollars and he labored night and day on his translations under the stimulus of both ambition and poverty. His different translations aggregated nearly fifteen hundred pages during this first eighteen months. At this time, in spite of his extreme poverty he married and returned to Easton, Pennsylvania, where he soon established a fair practice. During the two years and a half which he practiced in Easton he devoted his leisure time to the study of practical anatomy in a little dissecting room which he built at the foot of his garden. During the summer months he spent his time in composing a work on descriptive anatomy based on his dissection, which, however, was never published.

In 1833 through the help of Dr. Eberle, one of his college preceptors who had become professor in the Medical College of Ohio at Cincinnati, he obtained an appointment as demonstrator of anatomy and removed to Cincinnati, making the journey thence by stage, canal, and steamboat, in thirteen days. Soon after removing to Cincinnati he became a joint editor of the Western Medical Gazette, in which was published a review of Beaumont's treatise on *The Functions of Digestion*. In 1835 Gross was elected to the chair of Pathological Anatomy in the newly established Medical Department of Cincinnati College. Among his associates in the faculty of this school were Dr. Daniel Drake and Dr. Willard Parker, the latter afterwards professor of surgery in the college of Physicians and Surgeons of New York. A study of all the books on pathology which he could obtain and a large amount of practical post-mortem work enabled Dr. Gross to publish in 1839 his *Elements of Pathological Anatomy*. This was the first book on this subject in the English language and it passed through three editions and brought

him fame and practice. Da Costa says of these two volumes that they did more to attract attention to the subject than anything ever done in this country, and Keen says, "It is strange to think that in a then small western town in America a young teacher in a new medical school should have published the first book in the English language on Pathological Anatomy." The work was fully recognized abroad and soon after the publication of the second edition Gross was made a member of the Imperial Royal Society of Vienna.

After declining an appointment to the chair of medicine in the University of Virginia and of anatomy in the University of Louisiana, Gross accepted in 1840 an appointment as professor of surgery in the University of Louisville, where he was again associated with Daniel Drake, also with Austin Flint and many other leaders in medicine at that time. He held this position for sixteen years, with the exception of the winter of 1850-51, which he spent in New York as the successor of Valentine Mott, in the chair of Surgery at the University of New York. During this time he carried out his extensive experimental studies on injuries of the intestines. He states that he devoted much of his time for over two years to this work, testing all the more important methods of treatment then in use by experimenting on over seventy dogs. The results of his work, which included his directing attention to the necessity for taking in the submucosa in intestinal suturing, were published in a volume of two hundred and twenty pages, which was illustrated by wood cuts and colored engravings. In 1853 he published a comprehensive monograph *On The Results of Surgical Operations in Malignant Diseases*, comprising one hundred and twenty-seven pages and embodying the experiences of the principal surgeons of all countries. Gross was the first to recommend the systematic removal of the nearest lymphatic glands and extensive excision in the treatment of breast carcinoma and other malignant disease. In 1856 he helped to found the Louisville Medical Review, of which he was senior editor, but owing to his appointment as professor of surgery in the Jefferson Medical College only six numbers of this journal appeared.

In the fall of 1856 he entered upon his career as a teacher in Philadelphia, which lasted for twenty-six years of active work, until he resigned his chair in 1882. It was during this time that he reached the zenith of his success. His reputation did much to draw students to Philadelphia and usually the names on the Jefferson Medical College catalogue represented all the states and territories in the Union, as well as a number of foreign countries. With him were associated John K. Mitchell, Robley Dunglison, Charles D. Meigs, Da Costa, Biddle, Bache, Pancoast, and many other men, whose names are famous in medicine. Soon after going to Philadelphia he established with his pupil, T. G. Richardson, the North American Medico-Chirurgical Review, in which he introduced a new feature in that various departments were entrusted each to a separate contributor, who furnished abstracts of the current literature, thus keeping its subscribers informed with regard to the latest discoveries and improvements in medicine. Dr. Richardson subsequently moved to New Orleans to become professor of anatomy and later of surgery in the University of Louisiana.

Three years after going to Philadelphia, Gross published his well-known System of Surgery, which, though much of its pathology and practical teaching are now obsolete, is still a mine of information. It was translated into several foreign languages and did much to establish his reputation everywhere that surgery was practiced. It passed through six editions, the last appearing only seventeen months before his death. That when almost eighty years old he was willing to throw aside prejudice and accept the newly introduced principles and practice of Lister, shows the progressive character of the man. Dr. Keen says of his work as an author "He blazed more than one new trail in the forests of surgical ignorance. In the early part, and even in the middle of this century (the nineteenth century) it was rare for Americans to write medical books; the most they did was either to translate a French or German work or annotate an English one. He was one of the earliest to create an American Medical Literature of importance." His text-book on surgery gave a position to American surgery abroad, which we can now hardly appreciate, while, as already related, his pathological anatomy was the very first work in the English language on that most important branch of medicine. He was always a champion of the American medical profession and did much to arouse the pride of Americans in the achievements of their fellow countrymen. At various times he wrote much on the history of American medicine and surgery, including a volume of nearly eight hundred pages on "The Lives of Eminent Physicians and Surgeons of the Nineteenth Century." Besides his own original writings, Gross's work in reviewing foreign surgical literature and bringing it before the profession in America deserves special mention as well as his translations of a number of important French and German books, and his labors as joint editor of the Western Medical Gazette and editor and founder of the Louisville Medical Review and the North American Medico-Chirurgical Review.

Gross also appreciated the importance of medical societies in spreading knowledge. He was founder and first president of the American Surgical Association, of the Philadelphia Academy of Surgery, and with Da Costa he founded the Pathological Society of Philadelphia. A medical writer and teacher of authority, both in this country and abroad, he never held himself aloof from his less progressive fellows, but his influence and example did much to elevate the standard of American surgery.

As a surgeon Keen speaks of him as painstaking, thorough, and careful in his investigations of a case. "Skillful as an operator and having so vast an experience and equally extensive acquaintance with the wide literature of his profession, he was scarcely ever perplexed by the most difficult case and rarely at a loss as to the proper course to pursue in the most unexpected emergencies." His study of wounds of the intestines led to much of the modern, rational, and successful

abdominal surgery. He first advocated opening the abdomen in rupture of the bladder, amputation in senile gangrene, the immediate suture of tendons when divided in incised wounds, and extensive operation and excision of the nearest lymphatic glands in carcinoma. In his autobiography Gross says what few men of extensive practice can say, "I have never lost a patient upon the table from shock or loss of blood."

But he was perhaps at his very best as a teacher. I quote again from Professor Keen's address: "As a teacher, I can speak both with personal knowledge and enthusiasm. I can see his tall, stately form, his handsome face, his glowing features, his impressive gestures. He was earnestness itself. Filled to overflowing with his subject, his one desire was to impart to us as much of the knowledge he possessed as our young heads could hold. Repetition did not blunt the novelty nor time lessen the attraction of his theme. It always seemed as if he were telling us for the first time the new story of the beneficent work that surgery could do for the injured and the suffering. His whole heart was in his work. Especially did he inculcate the principles of surgery, for he was convinced, and rightly, that one who was thoroughly imbued with these could not go far wrong in his practice." The best evidence perhaps of the importance of his work as a teacher is the large number of his pupils and assistants who have attained eminence as surgeons and teachers of surgery in America. Among these should first be mentioned his own son, Samuel W. Gross, a surgeon of great ability and promise who died when he had hardly entered upon his career; Dr. T. G. Richardson, a pupil of Gross's at Louisville became Professor of Anatomy and later of Surgery in the University of Louisiana, New Orleans; David W. Yandell, also a pupil at Louisville, later occupied the chair of Surgery in the University of Louisville; Hunter McGuire, who left Jefferson College with several associates to join the Confederate Army at the outbreak of the Civil War, later became Professor of Surgery at Richmond, Va.; Clayton Parkhill was Professor of Surgery at Denver, Colorado; Phineas S. Connor occupies the chair of Surgery in the Medical College of Ohio at Cincinnati; Dr. W. L. Rodman, formerly a professor at Louisville, Ky., now holds the chair of Surgery in the Medico-Chirurgical College, Philadelphia; Drs. J. Chalmers Da Costa and W. Joseph Hearn are Clinical Professors in the Jefferson Medical College and Gross's eminent pupil Dr. William Williams Keen is his successor in the chair of Surgery at the Jefferson Medical College.

The urn in Woodland's cemetery, Philadelphia, in which Gross's ashes were placed after his cremation, bears this fitting inscription by Yandell:

IN MEMORIAM.
WITHIN THIS URN LIE THE ASHES OF
SAMUEL D. GROSS.
A MASTER IN SURGERY.

His life, which neared the extreme limits of the Psalmist, was one unbroken process of laborious years. He filled chairs in four medical colleges, in as many States of the Union, and added luster to them all. He recast Surgical Science, as taught in North America, formulated anew its principles, enlarged its domain, added to its art, and imparted fresh impetus to its study. He composed many books and among them

A SYSTEM OF SURGERY,

which is read in different tongues, wherever the Healing Art is practiced.

With a great intellect, carefully trained and balanced, he aimed with undivided zeal at the noble end of lessening human suffering and lengthening human life, and so rose to the highest position yet attained in science by any of his countrymen.

Resolute in truth, he had no fear; he was born tolerant and charitable.

Living in enlightened fellowship with all laborers in the world of Science, he was greatly honored by the learned in foreign lands, and deeply loved at home.

BEHIND THE VEIL OF THIS LIFE THERE IS A MYSTERY WHICH
HE PENETRATED ON THE
SIXTH DAY OF MAY, 1884.

HIS MEMORY

Shall exhort and his Example shall encourage and persuade those who come after him to emulate deeds, which great in themselves, were all crowned by the milk-white flower of

A STAINLESS LIFE.

It seems a pity to spoil such a climax but there are still a few points to which I venture to call your attention with regard to the lives of these men. You have already noticed a number of points of resemblance; a few moments further consideration will possibly serve to emphasize them: Both were for several years teachers of the fundamental branches of medicine; physiology and pathology in one case and anatomy and pathology in the other; both were teachers of surgery in two important medical schools of their respective countries; both were medical editors for many years, founders of national surgical societies, and the first real surgical leaders of their respective countries. Both had passed through the preliminary training which influences so greatly the character of every man's work and were well established in their profession before the introduction of anesthesia; hence they acquired the quick eye, ready judgment and rapid execution so essential to those days when every stroke of the knife meant agonizing suffering, "At that time a surgical procedure was a personal feat; the surgeon matched his courage, energy, and dexterity in an event. It was largely an attempt of the amphitheater in the mind of the surgeon, even if the spectators were few." Only the very rapid operator could hope to succeed. Now surgery has developed into a science, careful, painstaking, often wearisome to the spectators, rarely spectacular, as beneficial as it is laborious. Probably neither ever at all fully appreciated the significance of modern antisepsis in surgery nor practiced it, hence a great part of the most important modern surgery was entirely unknown to them. But Langenbeck by his resections, and Gross by advocacy of extensive excisions of malignant growths and removal of the lymphatic glands in carcinoma and his studies in intestinal surgery, laid the foundations on which are established much of our modern surgery of bones and joints, malignant disease and abdominal surgery. They were

both students of surgery who not only mastered the principles and methods then approved but who took pains to keep informed of the advance of knowledge by closely following the surgical literature of all progressive nations: Langenbeck's biographers specially mention the important influence of English surgeons on his work and Gross frequently acknowledges his indebtedness to French and German surgeons. Not only did they profit by the work of others but as medical editors, writers, and founders of journals and societies they greatly aided the spread of knowledge and brought prominently before the world their own work and that of their countrymen.

Perhaps Langenbeck and Gross were at their best as teachers; they both possessed the rare gift of simplifying, systematizing, and imparting knowledge; more important than this they filled their students with enthusiasm for work, they inspired men so that their pupils and their pupils' pupils occupy the chairs of surgery in a large number of the leading medical schools of to-day.

Their assistants were chosen and retained not because of influence, wealth or whim, but because of recognized ability and industry. Few of them have failed to find honored positions in which they have spread the fame of their masters. Up to the time of Gross in America and Langenbeck in Germany the surgery of these countries was entirely patterned after and subordinate to the surgery of England and France. We often forget that Germany is much younger as a nation and little older as a scientific people than we in America. Until these men had established their reputations neither country had produced a surgeon whose name and achievements were known in all lands where scientific surgery was practiced nor whose teachings were widely followed, even by his own countrymen.

Both had such a grasp of every detail of their professional work; such an appreciation of the fundamental biological branches and their bearing on clinical practice; such discriminations as to the relative importance of acquiring, applying, and imparting knowledge; such sympathy and desire to help their students, assistants, fellow practitioners and their patients; such personal magnetism and force of character that they became acknowledged leaders in surgery, masters whose teachings still live, even though their names and the significance of their work are sometimes forgotten.

NOTE.—I am chiefly indebted for facts with regard to the lives of these masters in surgery and estimates of the importance of their work to the following sources: Obituaries of Langenbeck by Küster, Bergmann, Guttmann, Gurlt, Sonnenburg, and Billroth in the Berliner klinische Wochenschrift; Deutsche medicinische Wochenschrift; Münchener medicinische Wochenschrift; and Wiener klinische Wochenschrift, of 1887; to v. Bergmann's "Zur Erinnerung an B. v. Langenbeck," and to frequent references to Langenbeck and his work in the lectures of Bergmann and König while a student at Berlin; Gross's Autobiography; Keen's address at the unveiling of the Gross monument in Washington; Appreciations of Gross by Flint, Yandell, and others in the Journal of the American Medical Sciences; and to personal letters from Drs. Keen, Conners, Nancrede, and Rodman.

LINES READ AT A DINNER GIVEN IN HONOR OF DR. ROBERT FLETCHER, JANUARY 11, 1906, UPON HIS EIGHTY-THIRD BIRTHDAY.

If age means but the sum of leaves
  Time's calendars unfold,
Our honored guest must recognize
  That he is rather old.

If youth means elasticity,
  A ready wit and tongue,
A mind alert, a spirit gay,
  He's eminently young.

If age means stores of learning ranged
  On ordered shelves along,
Still crescent 'neath the nurture of
  A guardian sage and strong,

All centered in an index which
  Is hidden in the brain,
Our friend has surely reached an age
  We may not see again.

If youth betrays itself by vim,
  And broken bones, soon healed,
A constant tendency to pry
  In every secret field;

By always leading in the van
  Of life's long search for truth—
Why then, despite his years, he's but
  The prototype of youth!

So here's a glass to four-score years,
  To ripe and wise old age,
To all the gains which gen'rous time
  Scores on his record page;

And here's a glass to fervid youth,
  To supple limbs and mind
Wherein hope's rainbow arches o'er
  All doubts that low'r behind;

And here's a health to him in whom
  All these conditions meet,
Old in all virtues born of days,
  Young where'er youth is sweet.

Long may he live to taste alike
  Of age and youth the joys;
Old, yes, in years, but in his heart
  A boy among the boys!

WILLIAM S. THAYER.

INDEX TO VOLUMES 1-16 OF BULLETIN.

A subject and author index of the first sixteen volumes of the Johns Hopkins Hospital Bulletin is now ready. As the edition will be limited, it is desirable that orders be sent in as promptly as possible.

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PROCEEDINGS OF SOCIETIES.

THE LAENNEC SOCIETY.

November 23, 1905.

DR. H. B. JACOBS, President. DR. H. W. BUCKLER, Secretary.

Tuberculosis a Social Disease. DR. S. A. KNOPF, of New York.

The social causes of tuberculosis in infancy may be acquired, or direct and predisposing. Cases of acquired tuberculosis, and by this is meant post-natal cases, for there are only about forty hereditary cases on record, may be the result of mothers infecting children by carrying them in their arms and coughing over them, and by using the same spoon to taste the child's foods. As the child grows older and crawls it may become tuberculous, whether the mother is or not, because the father may have spit on the floor and the child may inhale bacilli or put its fingers into sputum and into its mouth, or its nails may not be kept clean. Foundling hospitals and nurseries often cause a spreading of infection by keeping all kinds of children together. Among the predisposing causes we find a physiological poverty transmitted from parents to children, which is not confined to tuberculous parents alone. Tuberculous persons should be prevented from marrying. Statistics covering a large number of cases of tuberculosis in which the history of the parents has been gotten, show very frequently that the patient was the seventh or eighth child of poor parents and that from age the parents were not able to transmit much vitality to their children, or owing to poverty were unable to care properly for so many children. We should believe in quality rather than numbers in offspring. Raising children on a bottle is a very frequent predisposing cause of tuberculosis. We should feel keenly on this subject, for when the mothers of one generation fail to nurse their children, the next generation has more difficulty. The majority of mothers can nurse their children, at least in part, and the female child will receive from such a mother the ability to nurse her child in turn. Although there may be some discussion as regards transmission to man of bovine tuberculosis, it is not safe to give milk to a child unless the cow has been found non-tuberculous.

A society in Paris has for its object the taking of children from tuberculous parents and placing them in homes and sanatoria for the sole purpose of preventing these children from contracting the disease while young. To prevent social and post-natal infections we need an education of the future mothers and an education for the school life of the children. A predisposing cause in school children is the overtaxing of their minds to the detriment of their physical beings. They are taught too much of the sciences and not enough of their own well being. Among the predisposing causes of tuberculosis in the college student, must be mentioned overdoing athletics. Statistics have shown that when the college athletes contract tuberculosis they go down twice as fast as others who had never heard of athletics. In the tenement districts little children go to school, often to stay all day, having for lunch only an apple or a couple of crackers. In Berlin a movement has been started to give each such little underfed child two sandwiches and a glass of milk for lunch, and all have increased in weight and done better school work. These results open a great field for philanthropy. Child labor is a great predisposing cause. Many poor girls and boys, while growing, and when they need all the fresh air and play they can get, are forced to remain indoors, and often in sweat-shops, from twelve to sixteen hours a day. It is a disgrace to the American people that some of the States permit this. Alcoholism among child-laborers is also a great factor in producing disease, for if children begin to take alcohol as a stimulant, not having the moral fiber to resist, they soon take it to excess.

Among the predisposing causes of tuberculosis in adult life are tenements, workshops, and alcoholism, under the last of which must be mentioned the use of patent medicines, for by their use a vast amount of alcohol is consumed. Over two hundred million dollars are spent annually for patent medicines, and the percentage of alcohol in a few of them may be seen in the following list: Green's Nervura 17 per cent; Hood's Sarsaparilla 18.5 per cent; Hoffman's Sulphur Bitters, 20.5 per cent; Lydia Pinkham's Vegetable Compound, 20.5 per cent; Paine's Celery Compound, 21.5 per cent; Ayer's Sarsaparilla, 25.6 per cent; Peruna, 28.5 per cent; Warner's Safe Tonic, 35 per cent.

Among the social causes of tuberculosis in adults is a lack of sanatoria for the treatment of tuberculous patients. We have no specific; but good food, fresh air, and plenty of water inside and out constitute the modern hygienic treatment. Sanatoria are necessities for consumptives among the poor and middle classes. We must aim to isolate the poor consumptives who are a menace to their fellow-men. We must have better medical attention. We must begin at the bottom of the problem, dealing first with the laboring classes, trying to provide better homes and places for Sunday recreation. We must make provision for the starving little ones. We make an appeal to the philanthropists who build churches, cathedrals, and libraries, to build model tenements where the laboring man can be happier, can frequent saloons less, and can sow less tuberculosis, for the man who serves his Creator in improving the conditions of his fellow-man serves his Creator best.

The Relation of the State to the Tuberculosis Question. DR. J. P. C. FOSTER, of New Haven.

Dr. Foster advocated the inspection of milk and intelligent legislation to secure the production of milk under sanitary rules. Every farmer selling milk should have his premises inspected and should be licensed. The construction of tenement houses should also be regulated. The registration of

tubercular cases should be enforced by the State for the protection of the well, and the better care of the sick who need help. Spitting in public places should be prohibited by law and the law should be enforced. The State cannot make provision for the care of all tubercular patients. They are too numerous. Each community through local, non-political boards should establish camps and shacks for the care of its own patients under the general supervision of State boards of inspection. The cost of constructing camps, shacks, and sanatoria should be reduced to a minimum and the money thus saved should be expended for nursing and competent medical care. The State, however, should share in this work by assisting local sanatoria intended for acute or incipient cases among the poor. Such local sanatoria should each represent a community of 250,000 persons and the State should aid them in a systematic manner. (The paper of Dr. Foster is published in full in the January BULLETIN.)

DISCUSSION.

DR. JOHN S. FULTON said: Not many years ago we were at the beginning of this work and the few hygienists who were interested made the mistake of applying procedures used in a different class of infectious diseases. In Maryland among measures to promote general prophylaxis are food inspection, inspection of milk supply, factory and child-labor inspection. There is also a State law against spitting but it mentions nothing about tuberculosis. As a special prophylaxis there is registration of tuberculous patients which has for its object a different purpose than the registration of acute infections. Many of the difficulties encountered elsewhere have not been met here. The registration began on the 27th of last April and during the first year cases have been satisfactorily registered. The registration in this State is guarded against public inspection. As a measure of domestic prophylaxis the consumptive must be reached at his home as soon as possible. This is done through the physicians who give advice and distribute sputum cups. The State pays a dollar and a half for each name turned in. Disinfection in Maryland is done by local boards of health, the law being mandatory. It is done with consent of the public or, if necessary, without it. The physician can do much by preparing the minds of the family to consent to disinfection after the patient's removal or death. About half the cases of tuberculosis in the State are not under medical observation.

DR. OWENSBY of the Bay View Asylum spoke upon the frequency of pulmonary tuberculosis in the insane. At Bay View it is five times more frequent than among the sane. Of 387 deaths at Bay View Asylum during the last eight years 75 were due to tuberculosis; 56 per cent of these were blacks and 44 per cent whites; 31 per cent of the patients gave tuberculosis as a cause of death in either parents, brothers, or sisters.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

December 4, 1905.

DR. W. G. MACCALLUM, President. DR. C. H. BUNTING, Secretary.

Calcification of the Breast. DR. THAYER.

Dr. Thayer presented a colored girl, aged 16, who was admitted to the hospital on October 2, complaining of an illness which began eight days before with a chill, followed by pains in the bones, anorexia, diarrhœa, and occasional vomiting. Examination justified the diagnosis of typhoid fever. There was an absence of leucocytosis and a positive Widal reaction. The patient soon became very ill, the pulse rapid and slightly irregular, the blood pressure (maximum) between 80 and 90. On the 19th day of her disease there were several profuse hæmorrhages from the bowels. The condition of the patient was bad, the pulse at one time being as rapid as 164. ℞ Calcii lactatis 2. every four hours. At 11 a. m. an infusion with 500 cc. of a 1 per cent solution of calcium chloride was given under the left breast; the breast tissue was not punctured. The coagulation time of the blood on the following day was eleven minutes. There were several subsequent small hæmorrhages but the patient gradually improved. The administration of the lactate of calcium was continued for eleven days. On the 35th day of the disease the left breast was found to be the seat of a large fluctuating abscess which ruptured during examination. This was freely opened, a large quantity of thin brown pus with several large sloughs escaping. Cultures from the pus showed staphylococcus aureus and bacillus typhosus. Eleven days later it was noticed that the edges of the wound, especially about that side invading the breast tissue showed a bony hardness. This sclerotic rim extended back at least 4 cm. from the opening of the wound. The pale granulation tissue contained numerous white spots and streaks which, when touched with the probe, felt like stone. These areas resembled closely the deposits of guanin in old ham. The probe introduced into the wound revealed the same sort of tissue wherever it could be passed.

Microscopical examination showed a granulation tissue with a fibrous basis containing many polymorphonuclear leucocytes, the lymphoid cells predominating. There were some epithelioid cells—a few giant cells—no tubercles. Areas of calcification were seen. No tubercle bacilli were found and there was no evidence of tuberculosis elsewhere. Examination of the calcified material showed that it consisted of phosphate of lime in some organic compound.

In addition to the calcification in the granulation tissue, there was a chain of hard nodules in the outer and upper part of the breast and a few small discrete nodules in the breast above the wound. There were a few enlarged glands in the left axilla which, however, were not strikingly hard. The calcium deposits had clearly diminished in size.

The condition appeared to be unique. The deposition of calcium in old tuberculous areas, in gummata, in atheroma-

tous patches in arteries, in necrotic areas in general, and especially in areas of fat necrosis, is familiar. The so-called metastatic deposition of calcium in diseases of bone is well known. Kaufmann has described a case of osteo-porosis in which there was a calcified infarct as large as a child's hand. Animals in which the calcium content of the blood is normally high, such as rabbits, have a peculiar tendency to deposits of lime salts. Litten has shown that if the circulation in a renal artery of a rabbit be cut off for from one to four hours, extensive deposits of calcium may be found in that part of the kidney supplied by the occluded vessel. Certain poisons have been shown to favor the deposition of lime salts in the kidneys and in the liver. Especially notable are the salts of the heavier metals, lead, bismuth, and mercury, of the metalloids, iodine, of organic compounds, aloin and iodoform. These poisons probably produce degenerative changes in the cells of the kidneys and liver which are followed by the deposition of calcium; but not all poisons which produce necrotic changes predispose to these deposits. v. Kossa has shown that in animals in which the calcium content of the blood is artificially increased, calcification of the kidneys and liver may be induced by the administration of much smaller quantities of the predisposing poisons. Thus, in rabbits to which calcium chloride has been administered subcutaneously, relatively small doses of iodoform result in deposits of lime salts in the kidneys.

It is extremely interesting to note analogy between these experiments of v. Kossa and the condition which exists in this case. The patient had received 132 grammes of calcium lactate by the mouth during eleven days, in addition to 5 grammes of calcium chloride by subcutaneous infusion. A large abscess of bacterial origin developed during the time that the patient was receiving the calcium lactate. The cavity with its necrotic borders was packed with iodoform gauze, and iodoform is known to be a poison the absorption of which in animals favors the deposition of calcium. Wherever the gauze touched the wound there was a rim of calcium deposit.

An attempt will be made to reproduce the condition experimentally in animals.

Yellow Fever. Remarks on the recent epidemic in New Orleans. DR. F. H. WATSON.

When yellow fever was discovered to be epidemic in New Orleans last summer it bid fair to outstrip the epidemic of 1878. For some time, with the histories of the past epidemics fresh in their minds and a realization of the paralysis of business and municipal demoralization that the known presence of yellow fever would cause, physicians have hesitated to diagnose and to report cases. Since 1897 there has been more or less yellow fever in New Orleans. The weather conditions of the past summer were most favorable. The first cases were reported on July 21. The city Board of Health immediately took hold and tried to cope with the epidemic until August 9, when, in response to a call, the United State Marine Hospital and Public Health Service sent assistance under the direction of Dr. J. H. White. The city was immediately divided into sections, the ward sections being under supervision and reporting to ward headquarters and these to central headquarters. The work consisted of: first, an educational campaign to convert the people to the mosquito theory; second, anti-mosquito measures for the destruction of breeding places. The *Stegomyia fasciata* breeds mostly in clear water, so all the cisterns and water barrels were oiled with a high-grade oil, as many of these were used to hold drinking water. All water-containing vessels were covered with netting or cotton sheeting. Stagnant pools were oiled, salted or filled in. Regular hours for fumigation were established, e. g., Sunday at 10 a. m., when with the sulphur furnished by the city, the buildings were fumigated. Next came a campaign against the spread of infection. All cases were isolated by covering the bed with netting and closing the room with netting. A preliminary fumigation was done, and, on or before the tenth day, the entire house and outhouses were fumigated. No methods other than those against the mosquito were used at any time. Every house was visited by the United States Marine Hospital authorities at least three times a week. When the fever was reported last July there were two hundred cases in the city, which is a greater start than the epidemic of 1878 had, in which later in the epidemic there were three hundred new cases a day. All former epidemics have died out with the approach of cold weather.

Practical points brought out by the epidemic:

The cistern should be absolutely mosquito-tight, and water barrels, troughs, etc., should be oiled or emptied daily. To prevent secondary cases seal the room to keep infected mosquitoes from escaping. Sulphur is the best insecticide, but it tarnishes brass and is injurious to pianos. Pyrethrum powder was used somewhat, but it does not kill, only stuns, and the mosquitoes have to be swept up and burned. If there are cases in a block the whole block should be fumigated. Yellow fever is a house infection, for Stegomyia is a house mosquito, going out only for water. It is not likely that it will fly as far as across the street, so one has practically only the infected house to deal with, unless there are other houses very close. Yellow fever does not necessarily mean black vomit, suppression of urine and death. There may be cases so mild as to last only twelve hours. The mild cases are very dangerous, for not being recognized or considered they are important in spreading the disease. Diagnosis is not positive until the fourth or fifth day, so all fevers should be reported immediately and the family physician held responsible. Thorough screening and fumigation prevent secondary infections. The concealed cases are the most difficult to deal with. These and the mild unrecognized cases go hand in hand, and the fight is successful only when both of these are cared for.

Studies from the Craig Colony for Epileptics with Biograph Illustrations. DR. W. G. CHASE, of Boston.

Dr. Chase gave a very interesting short talk on the development of photography from the wet-plate days of thirty-five years ago to the complex films and cameras used in the biograph of to-day. He spoke of the advantage of the bio-

graph both in studying and in teaching medicine, and illustrated his remarks by throwing on a screen from fifteen hundred feet of films, pictures showing in characteristic movements and attitudes, in attacks, and characteristic gaits, cases of rhythmic idiocy, double nystagmus, grand mal, Jacksonian epilepsy, status epilepticus, athetosis, hemiplegias, etc. The pictures were very clear and showed patients in attitudes and movements that the average practitioner seldom sees. Particularly interesting were the pictures showing complete attacks of epilepsy, those showing the sleeping positions of epileptics and the swaying movements of rhythmic idiots. The value of the biograph in clinical teaching was particularly emphasized, for these pictures could be thrown upon the screen to illustrate cases and for comparison at any time, whereas in most clinics such cases are not always available for exhibition and seldom for comparison.

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NOTES ON NEW BOOKS.

A Manual of Chemistry, Inorganic and Organic, for the Use of Students of Medicine. By A. P. LUFF, M. D., B. Sc. (Lond.), F. R. C. P., F. I. C., Physician to St. Mary's Hospital, and Lecturer on Medical Jurisprudence in the Medical School, and F. J. M. PAGE, B. Sc. (Lond.), F. I. C., Associate of the Royal School of Mines, Lecturer on Chemistry and Physics to the London Hospital Medical College, Examiner on Chemistry and Physics to the Society of Apothecaries, London, etc. Illustrated with 43 engravings. Third edition revised. 16 mo. 538 pages. (*Chicago: W. T. Keener & Co., 1905.*)

This book is intended as a guide to the study of chemical science for the use of students of medicine. The fundamental principles of chemistry are presented clearly and concisely, and the fact that a third edition was necessary, indicates that the book has found a field of usefulness. The first 332 pages are devoted to inorganic chemistry, while organic chemistry is presented in 154 pages. The difficult task of treating a subject of such magnitude in such a small compass has, as a whole, been accomplished successfully. We cannot here consider the individual chapters. It is evident that only little space can be devoted to physiological chemistry in a work of this kind. In the brief presentation of this part a few errors have crept in. Thus, in connection with the ferments we find preserved the old division into organized and non-organized ferments. Since it has been shown that the ferment activity of microorganisms is not dependent on their life processes this division has been abandoned. The general statement that putrefaction requires a certain amount of air to start the process is erroneous. These errors do not detract seriously from the value of the book since it does not pretend to treat fully of these subjects. The book can be recommended. S. A.

Ophthalmic Neuro-Myology. A study of the normal and abnormal actions of the ocular muscles from the brain side of the question. By G. C. SAVAGE, M. D., Vanderbilt University. (*Nashville, Tenn.: Published by the Author.*)

This book serves to set forth the author's views regarding the influence of certain cerebral and basal centers which he has assumed exist, in the control of ocular movements. To quote from the preface, "The hypothesis on which Ophthalmic Neuro-Myology is founded may be stated as follows: There are eight conjugate brain centers in the cortex, by means of which the several versions are effected, and one conjugate center by which conveyance is caused. These conjugate centers act alike on orthophoric and heterophoric eyes, and when there is only one eye. Each of these is connected with two muscles, and the work done by the center and its muscles, under the guidance of volition is normal work. The conjugate centers have no causal relationship with the heterophoric conditions, nor have they any power for correcting them. There are twelve basal centers, each connected with only one muscle. If the eyes are emmetropic-orthophoric these centers are forever at rest, but when there is any form of heterophoria, one or more of these centers must be ever active during all working hours. These centers do not cause heterophoria but they stand ready to correct it. Under the guidance of the fusion faculty, each basal center stands ready to act on its muscle whenever there is a condition that would cause diplopia."

We cannot believe that there are basal centers which exist for the sole purpose of sending supplemental charges of what the author calls "neuricity" to weaker muscles when necessary. This would be at variance with established physiological facts, and we do not believe that nature has provided unique and special "safety-valves" to correct muscle errors in the eyes. Where

the premises are hypothetical the conclusions must also be so, and the deductions made by the author are to say the least artificial and fanciful. The deductions are made at will by the author, but we do not believe that many of the ideas which he has arrived at will be established by facts, physiological, pathological, or otherwise.

B. B. B., Jr.

An Introduction to Dermatology. By NORMAN WALKER, M. D. Third edition. (*Bristol: J. Wright & Co., 1905.*)

It is surprising how much has been comprehended within the 281 pages of this book.

There are about 100 illustrations. Of these the photographs are very much better than the colored plates, which are too highly colored and do not give a very good idea of the disease represented.

Classification of skin diseases is never easy, but the peculiarity of the author's arrangement can hardly be accounted for. There is no well-defined parasitic group and *pediculosis capitis* and *pediculosis pubis* are called infective inflammations, but *pediculosis corporis* is classed as an anomaly of circulation. The vegetable parasites are also grouped as infective inflammations, with the exception of *tinea versicolor* and *erythrasma*, for which a new class, saprophytes, is created.

There is more individuality shown in the contents than is usual in books of this class. The subject-matter is presented in an attractive way, and one does not tire easily in the reading.

The sections on treatment abound in excellent suggestions.

The book is well bound, the paper is good, and the type very clear.

Principles of Bacteriology. By A. C. ABBOTT, M. D. Seventh edition. (*Philadelphia and New York: Lea Brothers & Co., 1905.*)

Since the original appearance of Dr. Abbott's little book on the Principles of Bacteriology in 1891, so many advances have been made in our knowledge of this subject, that it requires considerable ingenuity in an author to include in one publication, the essential facts of the science. In the seventh edition Dr. Abbott has made a successful attempt to enlarge the scope of his previous editions, and he has, therefore, included a number of highly important advances in such subjects as the Morphological Classification of Bacteria, Bacteriological Technique, and Theories of Immunity. The present edition covers 700 pages and is a sensible, clear-sighted exposition of the subject. The chapter on Immunity is especially good from the historical standpoint and the author has not limited himself to any theory but gives in some detail the most important ideas which have been advanced to explain the complicated phenomena of serum-therapy. The names of the common species of microorganisms have been changed to conform to the accepted rules of botanical nomenclature, and some of the most recent investigations on species differentiation have been incorporated.

As the book is now presented it is a valuable treatise not only for the beginner in bacteriology, for whom the first edition was intended, but also for the more advanced student of to-day who has ready access to well-equipped laboratories in almost any modern medical school.

It is unfortunate that Dr. Abbott has still adhered to the plan of the original edition in which somewhat simple directions were given the student for the performance of bacteriological experiments. Such directions now following such a philosophical exposition of immunity as Dr. Abbott has given are to say the least incongruous, and we venture the prediction that in the next edition Dr. Abbott will drop completely this heritage of the past. We would suggest also that the appendix containing a long list of useless laboratory supplies might well be left to the reader's imagination. Could a few such drastic changes be made, the book would fulfill at once its present purpose, namely, to represent the entire subject of bacteriology in so clear, concise, and accurate a manner as to appeal to every student in our modern universities.

Practical Massage in Twenty Lessons. By HARTVIG NISSEN. (*Philadelphia: F. A. Davis & Co., 1905.*)

This book is a reprint of an earlier work of the author entitled, "Swedish Movement and Massage Treatment," published in 1889. Some small omissions are made, and about thirty or forty pages of new material, and twenty or more new diagrams and prints have been added throughout the text. The method of classification is also somewhat changed and improved.

But strictly speaking, the book should definitely be announced as an enlarged edition of an older publication. However unintentionally the impression is given, the book is practically offered as a new one, and the reader or student is not prepared to find that more than three-fourths of the two productions are word for word the same.

The title of the later book is hardly as accurate or comprehensive as the former one. In spite of a brief prefatory explanation as to the technical meaning of the term massage, the term will be misleading to the general mind, since the bulk of the book is given to the consideration of physical exercises or medical gymnastics.

It is to be regretted too, that in revising the book, the author did not cite further and more recent illustrations of cases treated; those given being almost exclusively dated in the Eighties, that is, in the pioneer days of the Swedish Movement Treatment in America.

But although the book cannot be considered a new contribution, except in small degree as mentioned, it is a greatly improved edition of its former self, and taken as a whole, it is perhaps, a rather more concise and practical presentation of the general subject of mechano-therapy than has been made elsewhere.

The literary merit is not high. And the tone of the book in some minor respects lacks in dignity.

But it cannot be doubted that the author clearly knows whereof he writes from personal, practical experience, and this, which is the most important point of all, gives interest and weight to the questions treated in spite of the crudities of the book in general.

H. C. BARTLETT.

Drink Restrictions (Thirst Cures) particularly in Obesity. By PROF. CARL VON NOORDEN and DR. HUGO SALOMON. Translated by BOARDMAN REED, M. D. (*New York: E. B. Treat & Co., 1905.*)

This monograph contains a very satisfactory historical review of all the conditions which have been treated by limiting the patient in his consumption of fluids and discusses the physiological changes which occur during periods of thirsting. The authors have studied especially the oxygen and nitrogen metabolism when the fluid intake is minimal and conclude that oxidation is not increased nor is the storage of nitrogen prevented. Whatever good results are obtained from "thirst cures" depend upon diminishing the work of the digestive and circulatory systems.

Manual of Chemistry. By W. SIMON, PH. D., M. D., Professor of Chemistry in the College of Physicians and Surgeons of Baltimore, etc. Eighth edition, with illustrations. (*Lea Bros. & Co., 1905.*)

This Manual of Chemistry is so well known to teachers of chemistry and students of medicine and pharmacy that an extended review of this, the eighth edition, is hardly necessary at this place. The work has been meritoriously popular from the

first edition and still maintains its position as one of the leading text-books in American schools of medicine. We heartily congratulate Dr. Simon upon the continued success of his work.

C. E. S.

Hygiene and Public Health. By B. Arthur Whitelegge, C. B., M. D., and George Newman, M. D., D. P. H. (*Chicago: W. T. Keener & Co., 1905.*)

This little book, dealing with the subject of hygiene and public health in a short six hundred pages, considers nearly every subject which could possibly have any relation to the science of medicine from the chemical and bacteriological standpoint. Mingled with a large amount of scientific information there is presented a complete system of the various enactments of the English government, regulating the duties and privileges of British officers of health. The information here presented gives a very practical insight into the practice of public health as it exists in England, and from a purely practical standpoint the book has value. The facts given are presented in a clear, concise, systematic manner, and it becomes a matter of considerable ease to inform oneself as to the usual conduct of matters pertaining to hygiene. Ten various enactments governing the sale of milk, meat, and other articles of diet, the laws regulating the proper construction of work-shops and tenement houses, the care of those sick with infectious disease and the disposal of the dead, together with such kindred subjects as disinfection and quarantine are considered at some length and in the main quite satisfactorily.

From the scientific standpoint, however, there are so many errors that the book could hardly be recommended to students or to practitioners unable to exercise a discriminating power of criticism. By way of example it is stated on page 364 that "milk has been abundantly proved to convey the diphtheria poison," on page 376 that "enteric or typhoid fever was differentiated from typhus in 1850 by Jenner," neither of which statements will pass unchallenged, especially the latter.

Again, on page 433, in the discussion of yellow fever, half a page is devoted to a consideration of Sanarelli's claims for the *Bacillus icteroides* as the etiological agent of the disease, followed by the statement that the United States Army commission could not confirm Sanarelli's work but reported that the disease was conveyed "*probably* by mosquitoes." The names of Reed Carroll, Agramonte, and Lazear are not mentioned, but we are informed that Guitéras has confirmed most of the commission's findings.

Finally, we read that a second U. S. Army commission reinvestigated the subject and found that a protozoan parasite *Myxococcidium stegomyiæ* was responsible for the spread of yellow fever and could be found in infected mosquitoes.

Further citation of errors is unnecessary as these examples but represent a mass of misstatements which rob the book of a large part of its usefulness.

Veterinary Pathology. By Friedberger and Fröhner. Vol. I, Infective Diseases of Animals. Translated by M. H. Hayes, F. R. C. V. S. (*Chicago: W. T. Keener & Co., 1905.*)

To the student of veterinary science Friedberger and Fröhner's Veterinary Pathology needs no introduction, the original German edition being universally employed in veterinary schools in Germany and Austria, and its French translation by Cadiot and Ries having been adopted as the highest authority in France. The present English translation by Hayes is of exceptional purity and gives in a very remarkable way the clearest English expressions for somewhat complicated German ideas.

The various animal diseases are treated with that comprehensive grasp and conservative judgment so characteristic of the Teutonic mind and throughout the entire book the most recent studies in animal pathology and bacteriology are presented with accuracy and clearness.

The chapters on tuberculosis, anthrax, rabies, and distemper are especially good. The distinction between the disease of hog cholera as it exists in this country, and infectious diseases of swine in Germany has not been clearly grasped by the authors, who, therefore, fail to give proper value to the investigations dealing with the hog cholera bacillus. This error, however, if error it can be called, is one common to the German bacteriologist and in no way detracts from the great value of the book.

We feel that this first volume of the Pathology can be most highly recommended to all our students, especially in view of our present great and increasing interest in the diseases of animals.

A Manual of Practical Hygiene. By Charles Harrington, M. D., Assistant Professor of Hygiene in the Medical School of Harvard University. (*Philadelphia & New York: Lea Brothers & Co., 1905.*)

We have already taken the opportunity in previous reviews of this text-book, of recommending its use by those who are especially interested in practical sanitation. The modern hygienist considers his subject usually from the standpoint of chemistry or bacteriology and Dr. Harrington has followed the former path to the understanding of sanitary problems. In the present edition however he has added a number of pages devoted to questions more purely of a bacteriological nature. Thus for instance he considers at some length the subject of Immunity and the Ehrlich theories, following this by a valuable account of an action of antitoxic sera in various diseases. The information presented throughout the book is given in a concise, systematic manner easily accessible to the reader. A few bacteriological errors have crept in, but they are mostly errors which are common to current literature. Such for instance is the consideration of *B. enteritidis sporogenes* of Klein as the etiological agent of summer diarrhœa, a claim by no means justified by the facts, since the organism obtained by Klein has been proved to be the *Bacillus aerogenes capsulatus* of Welch, which again has been shown to exist normally in the intestinal tract of nearly all individuals. The chapters upon the composition of food with a good discussion of their nutritive value appeal very strongly to clinicians who rely upon careful dieting in building up the strength of debilitated patients. Also the very excellent account of various epidemics of food poisoning with accurate data as to the number of cases, their symptoms and mortality, is another example of Dr. Harrington's habit of presenting his information in an easily-apprehended manner. Taken altogether the book is a very mine of information upon all sorts of subjects collateral to the science of medicine, and will prove of the greatest value in spreading our knowledge of practical hygiene. Finally we cannot forbear quoting from the section devoted to exercise, the statement that *golf* is "an ideal form of exercise for all ages above early childhood, and particularly for those whose lives are essentially sedentary or whose age precludes them from following the more violent games," a sentiment which will without doubt find ready acceptance in the Medical Faculty.

Neurotic Disorders of Childhood. By B. K. RACHFORD, M. D. (*New York: E. B. Treat & Co., 1905.*)

This book is divided into two parts: In Part I, after discussing the physiological peculiarities of the child's nervous system, the author reviews some of the important factors concerned in producing the neuroses. One chapter deals with the temperature in childhood; a second with the gastro-intestinal toxæmias; a third with auto-intoxication, including acid intoxications and thyroid and biliary toxæmias. In the chapter on bacterial toxæmias, tuberculosis, rheumatism, malaria and syphilis are dealt with, and the subjects of chronic anæmia, reflex irritation and excessive nerve activity are each given one chapter.

Part II (Chapters X-XXVII), is devoted to the individual neuroses. The neuroses dealt with are fever, eclampsia, laryngismus stridulus, tetany, enuresis, migraine, recurrent vomiting, toxic epilepsy, recurrent coryza, chorea, hysteria, headaches, asthma, disorders of sleep, nystagmus, habit spasms and pica or dirt eating.

The first part is the more interesting. The author makes very clear the relation between the neuroses and the important etiological factors such as heredity, age and the various depressing influences which may be present. Tuberculosis, and chronic infectious anæmia, mal-nutrition and reflex irritation receive especial attention in this connection.

In Part II, the subjects most fully discussed are eclampsia, enuresis, migraine, recurrent vomiting and epilepsy. Rachford follows the modern tendency not to attempt to separate too widely the various neuroses and in a very interesting chapter he reports selected cases in which one neurosis was succeeded by a different one during the progress of the patient's career.

In a number of places, for example in the chapter on migraine, the author reaches well beyond the confines of pediatrics and works over into the field of general medicine.

From the nature of the case there is considerable repetition in the book. What is said in Part I in the general discussion of the etiology of the neuroses is repeated more or less fully in the subsequent chapters dealing with the individual neuroses.

The style is lucid and possibly a trifle too didactic, the matter is quite well systematised, and the book is a good up-to-date review of our knowledge on the subjects discussed.

There is an index at the end of the book.

The Physician's Visiting List (Lindsay & Blakiston's) for 1906. Fifty-fifth Year of Publication. (*Philadelphia: P. Blakiston's Son & Co., 1012 Walnut St.*)

This handy memorandum book for physicians has been revised to bring it into harmony with the Eighth Decennial Revision of the U. S. Pharmacopœia. It is in compact form and easy to be carried, and contains such information as the physician needs to have ready at hand. It is to be recommended to all persons in the general practice of medicine.

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